

Davie County

Transportation Alternatives Feasibility Study



Kimley»Horn

DAVIE COUNTY, NORTH
CAROLINA



**Davie County Transportation
Alternatives Feasibility Study**

1 STARTING
POINT

The Feasibility Study Workbook

This Workbook summarizes the planning process and outcomes of the Davie County Transportation Alternatives Feasibility Study in five chapters:

1 | Starting Point

2 | Existing Conditions

3 | Interchange Feasibility

4 | Transportation Strategies

5 | Next Steps

Introduction

Protecting the long-term mobility of eastern Davie County can be difficult. Understanding that this community is just west of a major metropolitan city, Winston-Salem, as well as a part of the Piedmont Triad area, and is a part of an area that is beginning to feel the pressures of a neighboring community, brings to light a challenge that requires developing a strategy based on proved planning concepts and tested engineering principles. The Davie County Transportation Alternatives Feasibility Study blends the needs of motorists, bicyclists, pedestrians and emergency service providers into a plan for residents and businesses, all while respecting the history and amenities that give this community its charm and unique personality.

The *Davie County Transportation Alternatives Feasibility Study* is the blueprint for transportation alternative improvements and the foundation upon which future transportation decision should be measured against. The plan responds to existing challenges, anticipated future needs, and prepares the communities in eastern Davie County to accommodate future growth. The plan will guide

the community of Bermuda Run as well as the Winston-Salem Metropolitan Planning Organization (WSMPO) and the North Carolina Department of Transportation (NCDOT) to accommodate future growth and changes in the roadway network. This study should also guide future Town and County projects, small area plans, capital projects, and the implementation of NCDOT's Strategic Prioritization program for Division 9. As its core, this study evaluates the mobility needs of this growing community's connectivity to I-40 and determines interim and long term strategic approaches to improve mobility in the network. As with any study, the *Davie County Transportation Alternatives Feasibility Study* will need to be revisited as the future unfolds as projects are implemented and new information becomes available.

Eastern Davie County and the Town of Bermuda Run are impacted by the growth of Winston Salem, their own growth, and responding to changes within their corporate limits and the region. A community's transportation strategy is crucial when dealing with exigent congestion and preparing for future growth and emerging challenges such as traffic congestion, changes in land use, and economic stability. This alternatives feasibility study established a blueprint and

documents the transportation needs facing the study area. It also establishes a set of strategies that address the existing and projected transportation needs in the interim and long term buildout of the study area. As the foundation document for the study area, this study sets a course of action for future initiatives to work in unison toward a common goal for mobility in the study area. It should also serve as a guide for other community and state plans, capital projects, regulations, and programs, all which affect the community in large or small ways.

Purpose & Need

The purpose of the Davie County Transportation Alternatives Feasibility Study is to:

- 1) Identify mobility issues;**
- 2) Separate fact from perception**
- 3) Develop coordinated transportation solutions that protect what makes this community great.**

The planning process for this study delves into issues identified during stakeholder and steering committee

outreach efforts. The underlying need for this study is based on these outcomes and is expressed in the recommendations discussed later in this report.

Manufacturing, distribution and warehousing has been a staple to the Davie County economy for many years. Within the study area for this project these types of light industrial land uses are present and growing. Ashley Furniture Industries currently operates approximately 3.5 million square feet of manufacturing, warehousing and distribution operations at its Baltimore Road location within the study area. Current plans call for an increase of approximately 500,000 sf, equating to a total employment of approximately 3,000-4,000 persons at full buildout.

Within the study area there is a growing need for a new industrial interchange along I-40 between exits 180 and 174 to address concerns related to existing and future development, safety, and efficiency of the transportation network. Both of these existing interchanges have or will experience significant increases in congestion due to the growth associated with residential development, industrial, and schools. The growth of these land uses will add to the

traditional commuting traffic patterns experienced within the study area including NC 801, US 158, and I-40.

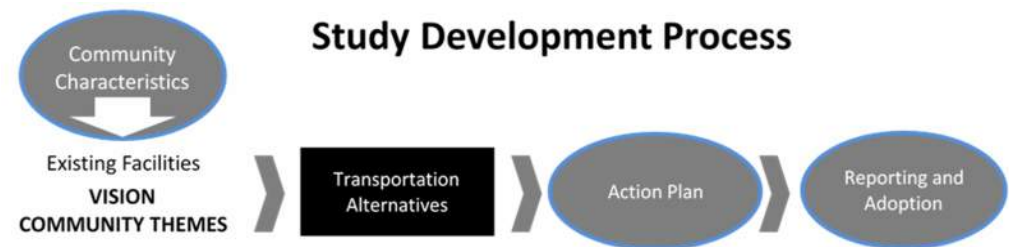
What is in the Study

The *Davie County Transportation Alternatives Feasibility Study* is designed to be a readable, functional document that will outline the community's transportation priorities and guide the future growth and development. The plan is organized into five Chapters

- **Chapter 1 | Starting Point:** Provides a foundation for understanding the plan, how it was developed and how it will be used.
- **Chapter 2 | Existing Conditions:** Describes the conditions of the study area roadways, intersections, and the operations for these elements.
- **Chapter 3 | Interchange Feasibility:** determines the feasibility of placing a new interchange on I-40 based on FHWA criteria, modeling, and geometric conditions along I-40.
- **Chapter 4 | Transportation Alternatives:** Graphically depicts alternatives for potential improvements within the study area.
- **Chapter 5 | Next Steps:** Identifies and prioritizes the necessary plans, programs, policies, and projects to fulfill the community's vision.

The Process

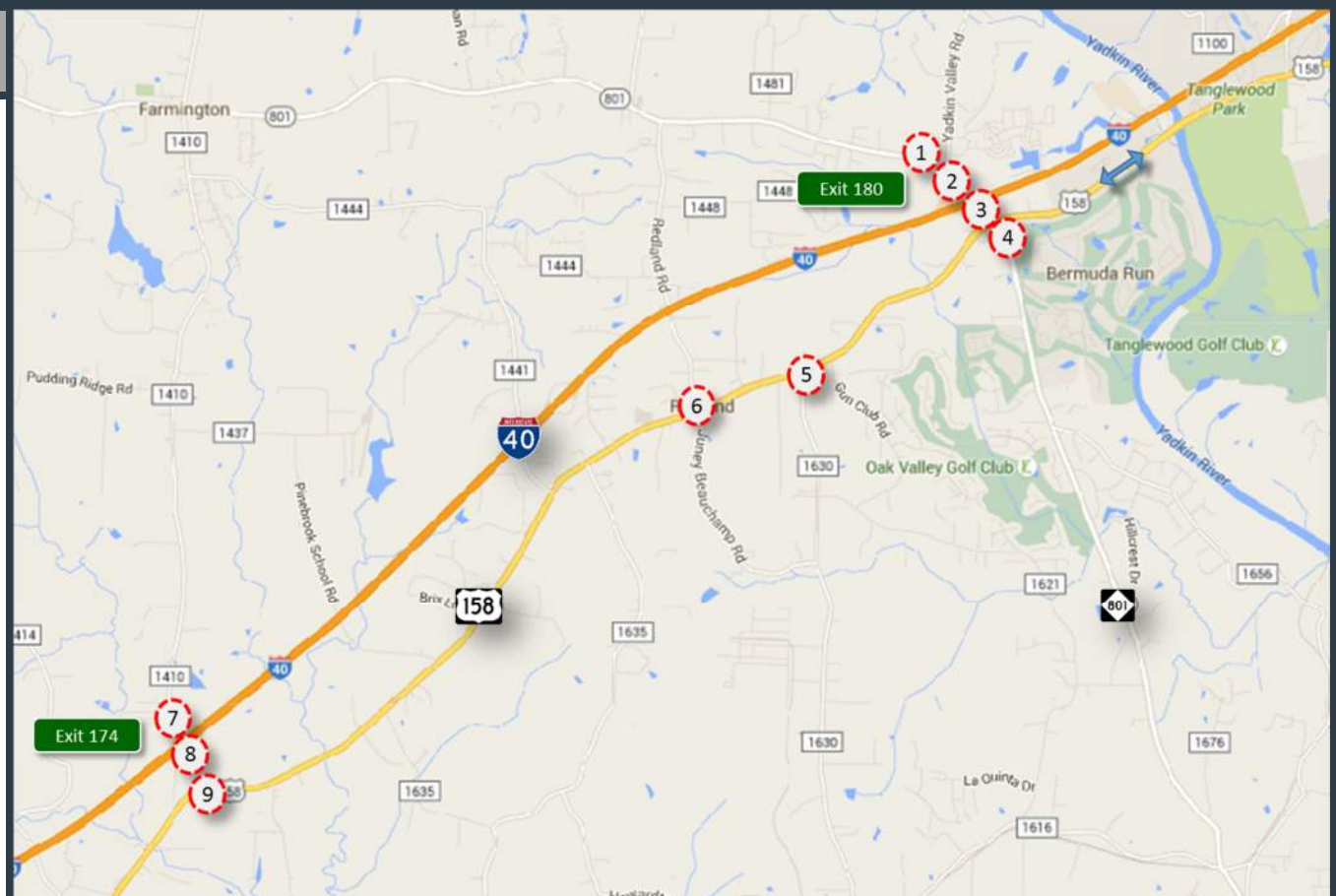
The *Davie County Transportation Alternatives Feasibility Study* was initiated to create a transportation strategy that best positions eastern Davie County to achieve success against a set of metrics that are clear, relatable, and important to leaders and residents. The study followed an intuitive process, as illustrated on the following page, to arrive at a blueprint for the future. The first phase documented existing conditions and identified the vision and community themes introduced in the pages that follow. The plan development phase balanced technical analysis with design elements. Once the short and long-term improvements were set, the action plan identified a phased set of improvements for implementation. The entire process is communicated and memorialized in this report.



The Study Area

The study area accounts for 6.2 miles of interstate along I-40 in Davie County, North Carolina. This stretch of interstate is currently home to 3.5 million square feet of industrial building space.

Based on discussions with the North Carolina Department of Transportation (NCDOT) and Davie County Staff, the study area was determined to include exit 180, and exit 174 along I-40. The study area also includes nine (9) intersections, including the four ramp terminals.



1. NC 801 and Yadkin Valley Road
2. NC 801 and I-40 WB Ramps
3. NC 801 and I-40 EB Ramps
4. NC 801 and US 158
5. US 158 and Baltimore Road
6. US 158 and Redland Road
7. Farmington Road at I-40 WB Ramps
8. Farmington Road at I-40 EB Ramps
9. Farmington Road at US 158



2 EXISTING CONDITIONS

Davie County *Transportation
Alternatives Feasibility Study*

Introduction

The eastern portion of Davie County has experienced a significant amount of change over the past 20 years. Rapid residential and commercial growth, the steady buildout of Kinderton and Ashley Furniture, and the development of Davie Medical Center has shifted the dynamics of Davie County and the Town of Bermuda Run. This change has raised concerns associated with the functionality of the area's transportation network. This chapter describes the existing context of the study area which will help shaped the recommendations in this plan.

Existing Conditions – Chapter Overview

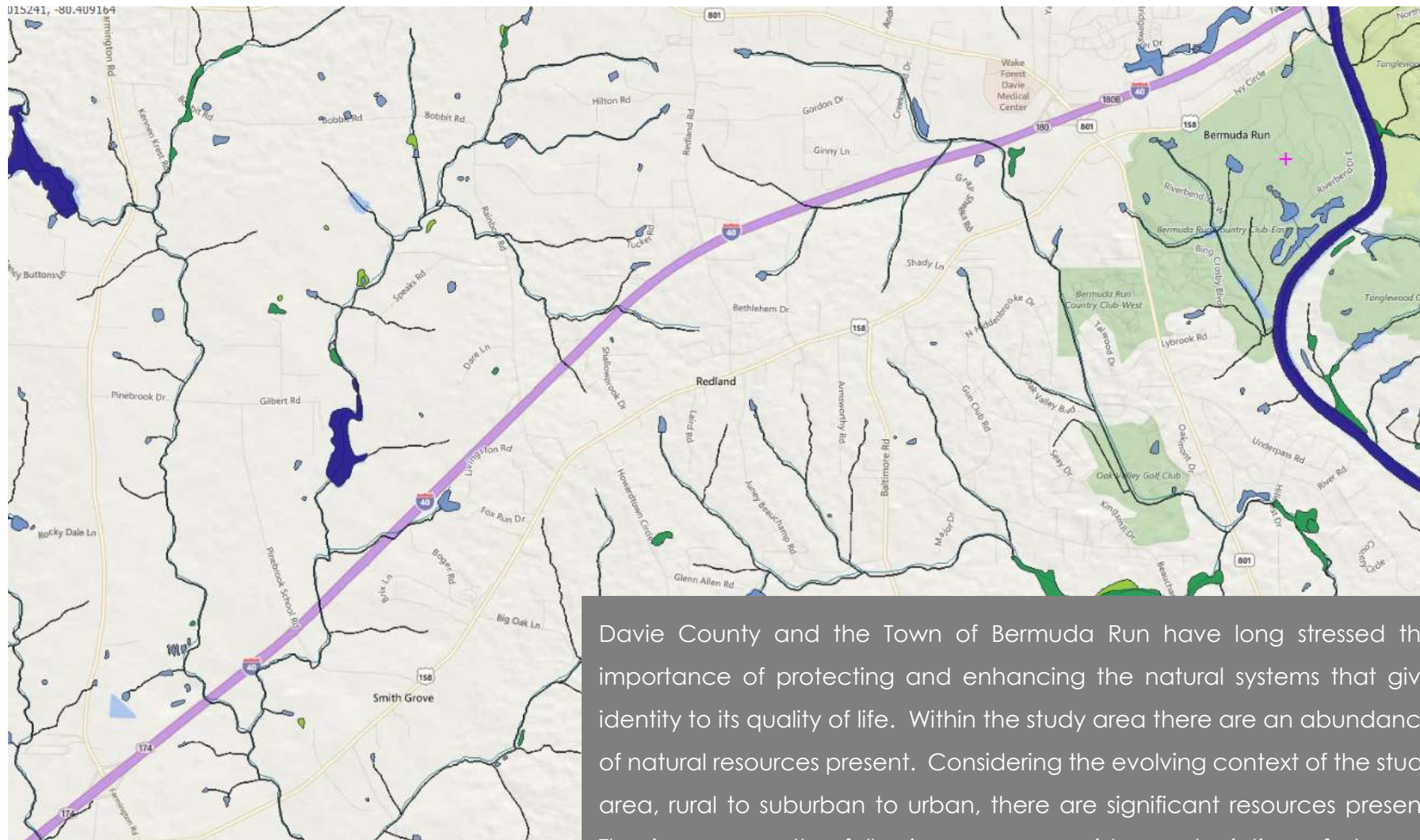
This Chapter provides a set of facts and figures related to natural resources, constraints, traffic, and safety. The Chapter concludes with a collection of maps that reflects the transportation, environmental, and land use conditions within the study area. The following topics are covered in this Chapter:

Built & Natural Conditions

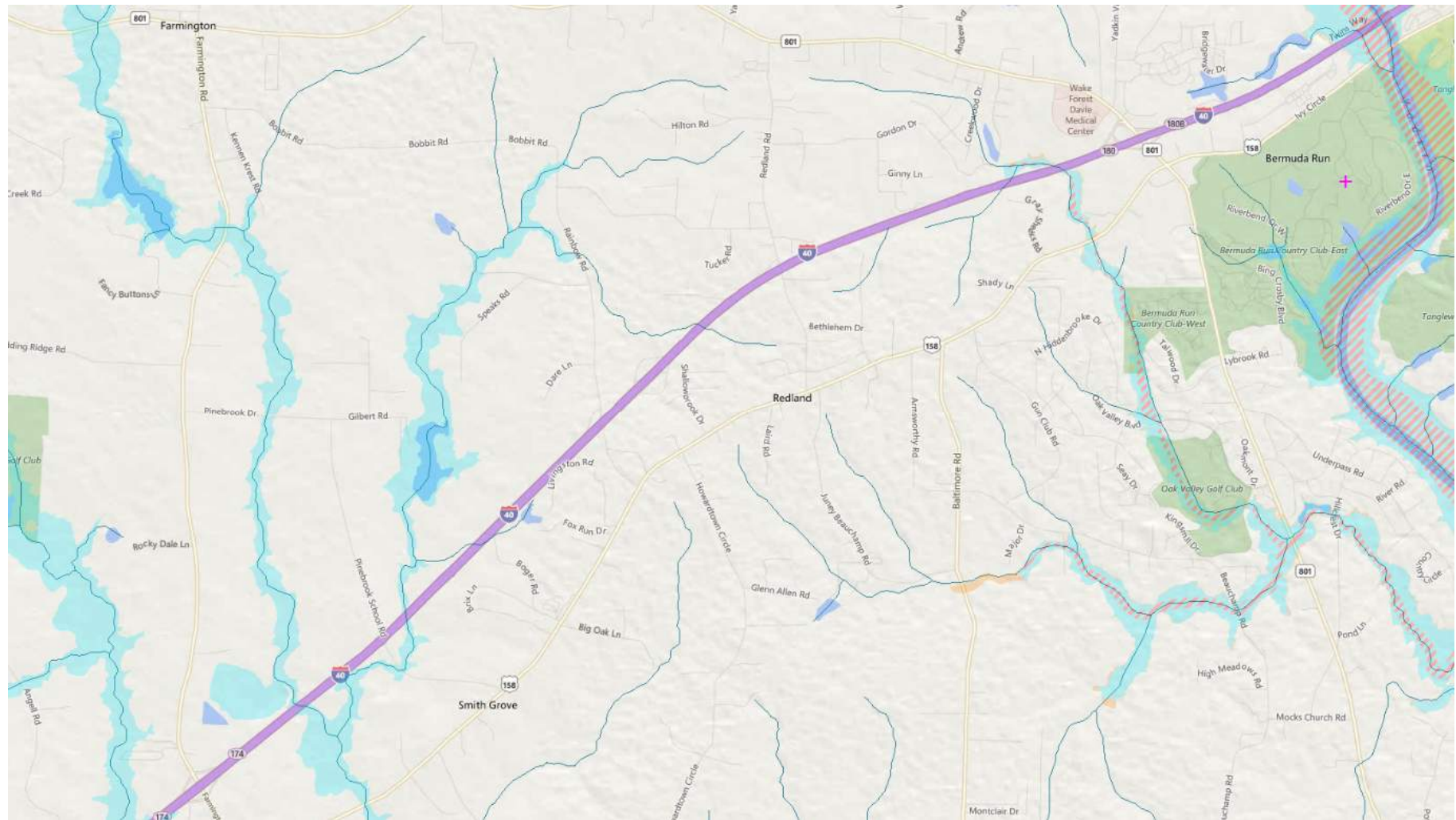
Transportation Characteristics

Safety



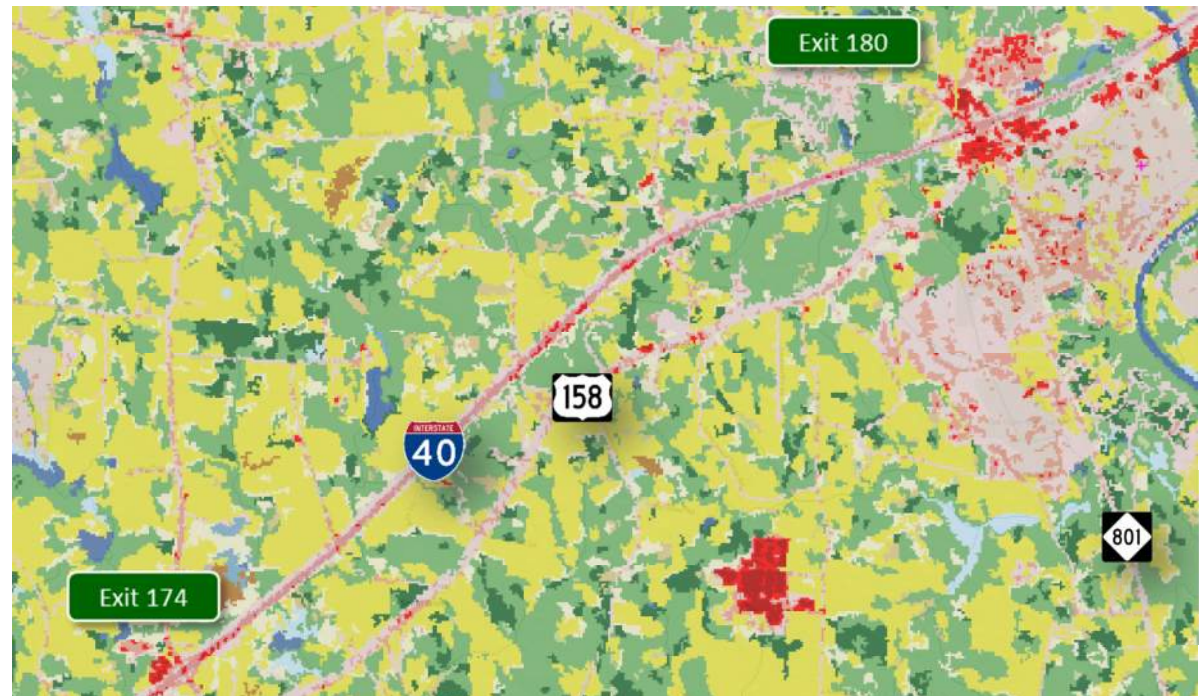
Natural Resources

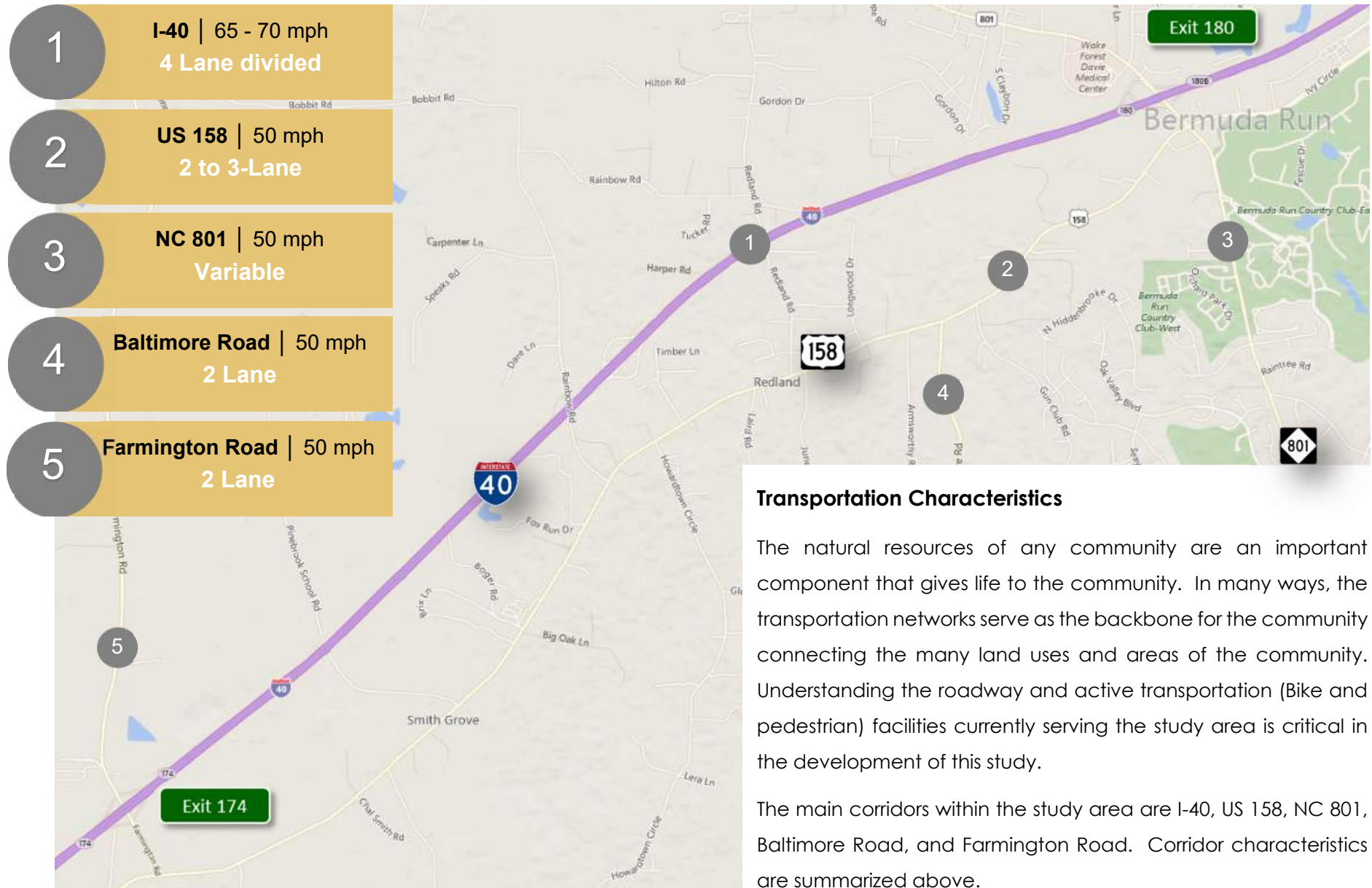
Davie County and the Town of Bermuda Run have long stressed the importance of protecting and enhancing the natural systems that give identity to its quality of life. Within the study area there are an abundance of natural resources present. Considering the evolving context of the study area, rural to suburban to urban, there are significant resources present. The images on the following pages provides a depiction of streams, wetlands, and flood zones present in the study area.



Built Environment

The perception most held is that the eastern portion of Davie County is over built or built out. While this perception is true for certain areas such as US 158 at NC 801 which is developed at medium to high density levels, much of the study area remains as pasture or farm land. The area along US 158 within the study area is developed, but at a lower intensity. It is important to also note the Ashley Furniture complex which is shown as developed, medium and high intensity.





I-40 is a 4-lane divided control of access Interstate running east-west through the study area with a posted speed limit of 65 mph east of Exit 180 (NC 801) and 70 mph west of Exit 180. The corridor has the following recorded 2015 NCDOT Average Annual Daily Traffic (AADT) volumes, reported in vehicles per day (vpd):

- East of NC 801: 51,000 vpd
- West of NC 801: 39,000 vpd
- West of Farmington Road: 37,000 vpd

US 158 is a major thoroughfare with a posted speed limit of 45 mph throughout the study area. The corridor runs east-west throughout the study area, parallel to I-40. The recorded 2015 NCDOT AADT volumes are as follows:

- East of NC 801: 11,000 vpd
- West of NC 801: 12,000 vpd
- West of Redland Road: 5,500 vpd
- East of Farmington Road: 4,800 vpd

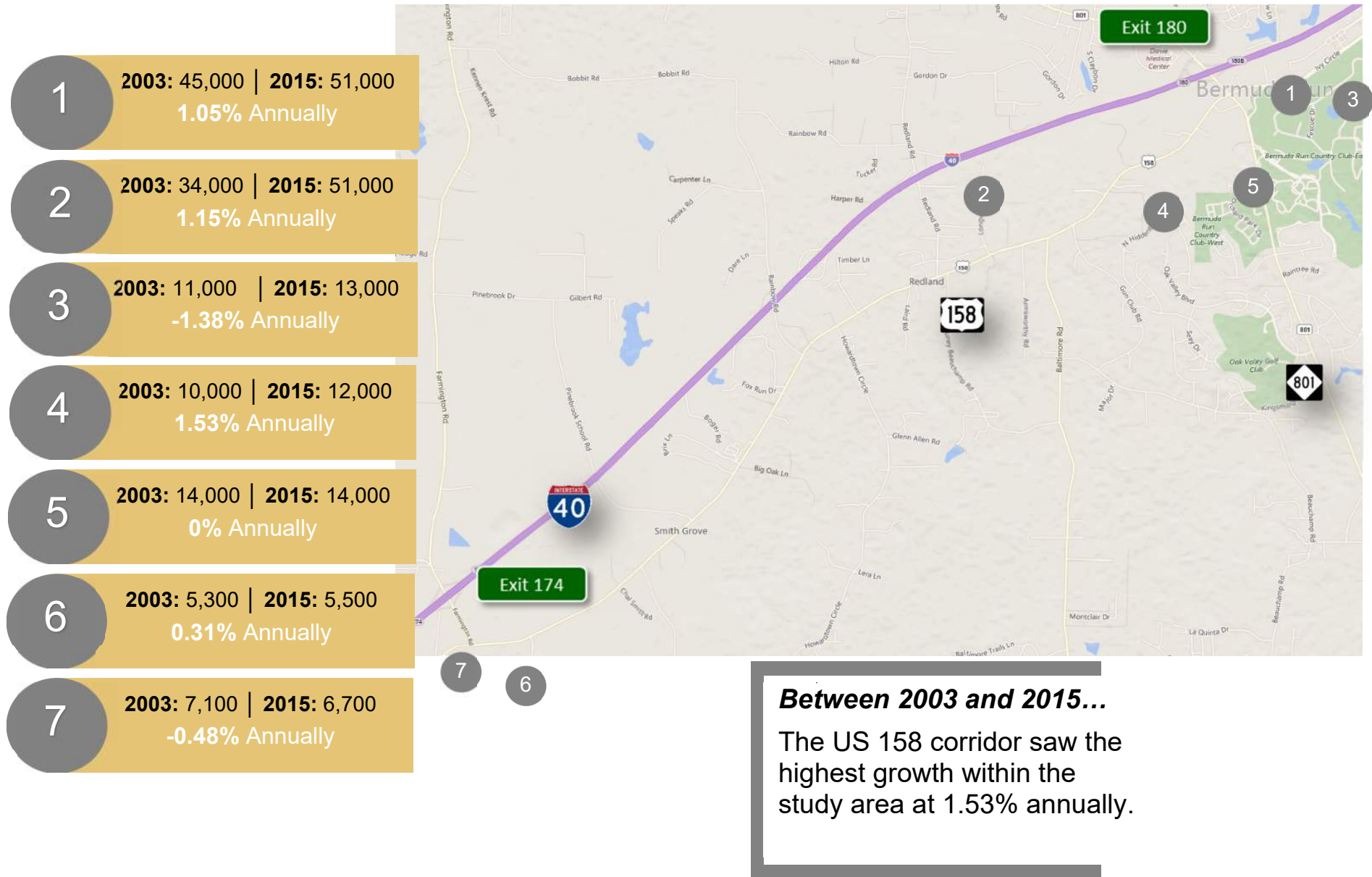
NC 801 is a major thoroughfare with a posted speed limit of 35 mph within the study area. NC 801 has a varying cross section from 2 lanes south of the intersection of Peachtree

Lane, multi-lane divided from Peachtree Lane to Yadkin Valley Road, and 2 lane undivided northwest of Davie Medical Center. The corridor has the following recorded 2015 AADT volumes:

- North of Yadkin Valley Road: 4,700 vpd
- South of US 158: 14,000 vpd
- South of Raintree Road: 9,500 vpd

Baltimore Road is a local street running north-south through the study area with a posted speed limit of 55 mph. The 2015 Average Daily Traffic (ADT) volume for Baltimore Road is 2,704 vpd.

Farmington Road is a minor thoroughfare running north-south through the study area. Farmington Road provides for the second interchange with I-40 west of the Yadkin River. Farmington Road has a recorded 2015 AADT volume of 6,700 vpd and a posted speed limit of 55 mph.



Traffic Counts

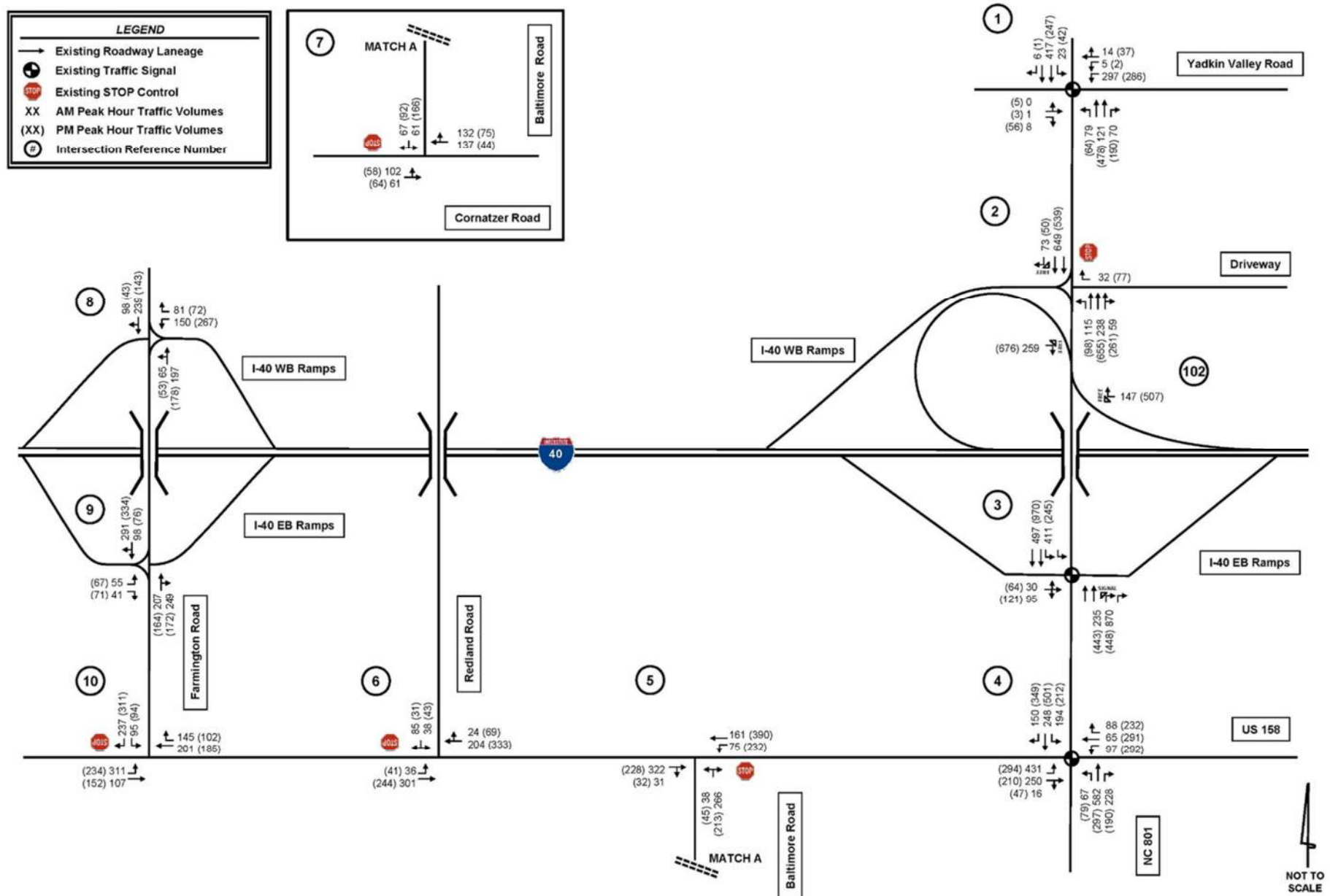
The foundational data used to analyze the performance of an intersection, both signalized and unsignalized, as well as corridors is turning movement counts. Count data was collected for the AM (7-9) and PM (4-6) peak hours for the following intersections within the study area on May 27th, 2015:

- NC-801 at Yadkin Valley Road
- NC-801 at I-40 WB Ramps
 - Counted at two locations to incorporate westbound exits allowing for exclusive right-turn slip lanes going each north and south along NC-801
- NC-801 at I-40 EB Ramps
- NC-801 at US-158
- Baltimore Road at US-158
- Redland Road at US-158
- Baltimore Road at Cornatzer Road

The AM and PM peak hours for each intersection are shown in Table 1

Table 1: Peak Hour Summary		
Intersection	AM Peak Hour	PM Peak Hour
NC-801 at Yadkin Valley Road	7:15 – 8:15 AM	4:45 – 5:45 PM
NC-801 at I-40 WB Ramps	7:15 – 8:15 AM	5:00 – 6:00 PM
NC-801 at I-40 EB Ramps	7:15 – 8:15 AM	5:00 – 6:00 PM
NC-801 at US-158	7:15 – 8:15 AM	5:00 – 6:00 PM
Baltimore Road at US-158	7:15 – 8:15 AM	4:45 – 5:45 PM
Redland Road at US-158	7:15 – 8:15 AM	4:30 – 5:30 PM
Baltimore Road at Cornatzer Road	7:15 – 8:15 AM	5:00 – 6:00 PM

A summary of the 2015 AM and PM peak hour volumes is shown on the following page:



to utilize the Farmington Road interchange over the NC 801 interchange to access the Ashley Furniture facilities and 2) trucks are avoiding the peak hours as much as possible to avoid congestion with other motor vehicles. The evidence for observation 1 is supported by the following AM and PM peak hour heavy vehicle volumes as shown in the table below.

Movement		Peak	Heavy Vehicle Percentage/ (Volume)
Exit 180	WB Off	AM	1.9% (5 vehicles)
		PM	0.3% (2 vehicles)
	EB Off	AM	1.1% (1 vehicle)
		PM	0% (0 vehicles)
Exit 174	WB Off	AM	1% (1 vehicle)
		PM	1.5% (4 vehicles)
	EB Off	AM	6.2% (5 vehicles)
		PM	1.4% (1 vehicle)
Baltimore Road	EB Right	AM	12.9% (4 vehicles)
		PM	12.5% (4 vehicles)
	WB Left	AM	0% (0 vehicles)
		PM	1% (2 vehicles)

except for certain movements at Baltimore Road and Farmington Road, that actual volumes are small for the peak hours. Per stakeholder conversations with Ashley Furniture, the Davie County facility receives between 250 and 375 trucks per day depending on the time of the year. Based on information provided from Ashley Furniture and collected turning movement counts, it is reasonable to make the assertion that trucks are intentionally avoiding the peak hours.



The turning movement counts indicate that while the percentages are within a normal range for an intersection,

NC 801 Interchange

The Exit 180 interchange is a semi-directional interchange between NC 801 and I-40 providing the primary access to the Town of Bermuda Run. Currently, the WB ramp is unsignalized utilizing directional ramps to minimize congestion and delay while the EB ramps are signalized. This configuration allows for optimal spacing of the traffic signals along NC 801 at US 158, EB I-40 ramps, and Yadkin Valley Road to operate efficiently and minimize delays associated with close intersection spacing.

The NC 801 interchange configuration has evolved over time due to development pressures adjacent to this intersection. The current configuration has been designed to provide for additional capacity in the future. Specifically, the NB 801 left-turn movement to WB I-40 has been designed to accommodate dual left turning movements. In addition, the WB off ramp has been designed to accommodate dual right-turning movements. The implementation of both of these movements would require the WB ramp terminal of the intersection to be signalized. However, with the signalization of this ramp, intersection spacing between the WB ramp and

Yadkin Valley Road would be approximately 500 feet. Given the high volumes currently using the interchange, the signalization of the WB ramp may not provide the anticipated capacity gains desired.

While this type of interchange is efficient at moving traffic (motor vehicles), it can be difficult for pedestrians to navigate. The directional movements (NB and SB loop ramps) and free-flow conditions can act as barriers for pedestrians trying to navigate this section of NC 801. Additional attentiveness is required by pedestrians crossing these movements as motor vehicles are most likely not anticipating pedestrians in these environments.



Farmington Road Interchange

The existing Farmington Road interchange is a standard diamond interchange configuration. This type of interchange configuration is one of the most prevalent, recognizable, and intuitive interchange configurations for drivers. Currently, both ramps are unsignalized and auxiliary turn lanes, right and left-turn lanes, are not present on the off ramps or on Farmington Road. Based on conversation with NCDOT, the existing bridge is structurally sufficient and is not planned for replacement in the foreseeable future.

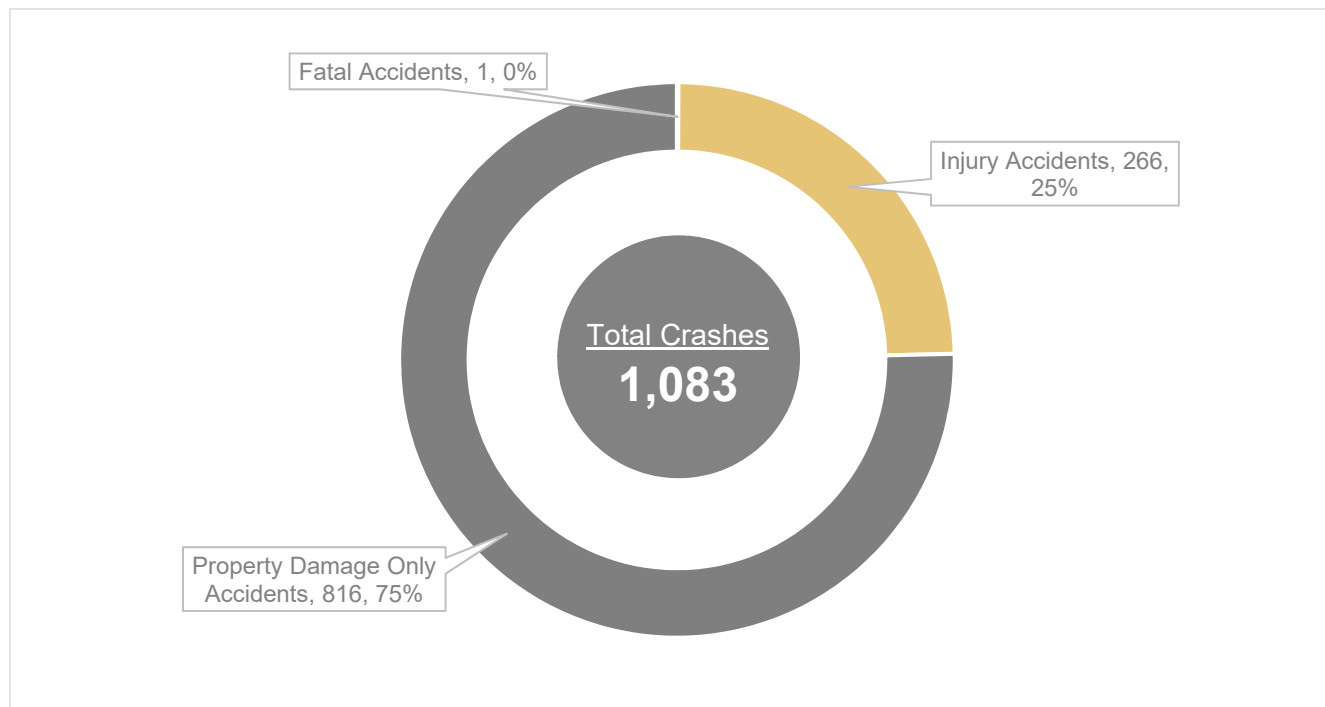


Crash Analysis

NCDOT keeps records of crashes that occur on state maintained roadways, with every crash being classified by the worst injury occurring as a result of the incident. For the five year period from 2010 to 2015, 1,083 crashes occurred in the study area. Available crash data for the study area was obtained from the North Carolina Department of Transportation.

The chart to the right breaks down the crashes by severity.

Type	Description
Fatal (K)	Death occurring within twelve months of the crash
Injury (C)	No visible injury, but those involved in the crash complain of pain or momentary unconsciousness
None (O)	No injury; property damage only

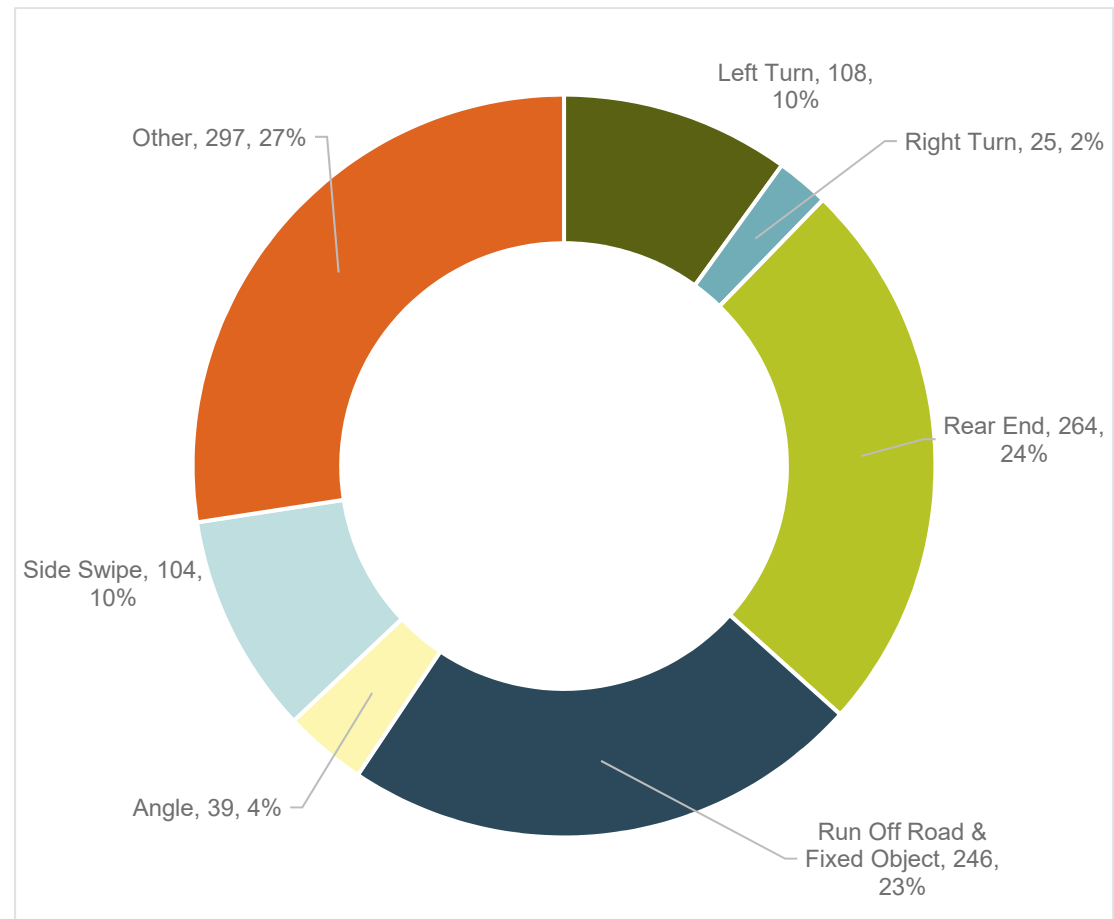


The frequency of each incident type was plotted to determine what kinds of crashes were occurring throughout the study area.

The incident types observed included:

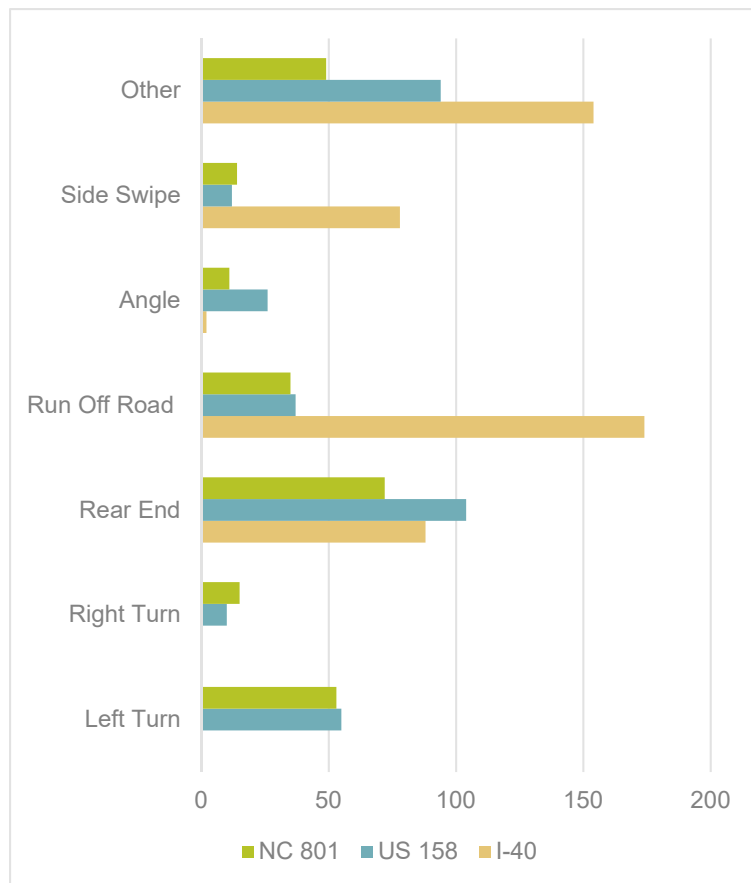
- Angle
- Left Turn, Different Roadways
- Left Turn, Same Roadway
- Other Collision
- Pedestrian
- Rear-end, Slow or Stop
- Right Turn
- Railroad/Train, Engine
- Sideswipe

This data was analyzed to identify current safety concerns and potential areas for safety improvement.



An analysis of this data was performed for the following corridors:

- I-40
- US 158
- NC 801



Vehicle Exposure Statistics	Per 100 M Vehicle mi	I-40 Corridor Farmington Rd to NC 801		
		Annual ADT	40,700	vehicles
Total Crash Rate	66.78	Total Mi	9.994	miles
Fatal Crash Rate	0.13	Total Veh Exposure	742.74	MVMT
Non Fatal Crash Rate	13.33	Severity Index	3.18	
Night Crash Rate	23.56	EPDO Crash Index	1,578	
Wet Crash Rate	18.98			
EPDO Rate	212.46			

Vehicle Exposure Statistics	Per 100 M Vehicle mi	US 158 Corridor Farmington Road to Yadkin River		
		Annual ADT	8,800	vehicles
Total Crash Rate	209.88	Total Mi	10.02	miles
Fatal Crash Rate	0	Total Veh Exposure	161.04	MVMT
Non Fatal Crash Rate	63.96	Severity Index	4.06	
Night Crash Rate	62.72	EPDO Crash Index	1,373.80	
Wet Crash Rate	21.73			
EPDO Rate	853.07			

Vehicle Exposure Statistics	Per 100 M Vehicle mi	NC 801 Corridor Redland Rd to Cornatzer Rd		
		Annual ADT	9,900	vehicles
Total Crash Rate	202.47	Total Mi	6.8	miles
Fatal Crash Rate	0	Total Veh Exposure	122.98	MVMT
Non Fatal Crash Rate	52.04	Severity Index	3.45	
Night Crash Rate	56.11	EPDO Crash Index	859.4	
Wet Crash Rate	33.34			
EPDO Rate	698.81			

Planned & Future Projects

The following projects are currently listed in the NCDOT State Transportation Improvement Program (STIP).

I-40 Widening and Rehabilitation (I-5794)

This project is listed in the NCDOT STIP and would widen I-40 to six lanes from two miles east of SR 1442 (Redland Road) to 1.4 miles east on NC 801. The proposed project is anticipated to begin summer of 2017.

NCDOT 801 Improvements (R-3610)

This project is currently an unfunded future project. The project would widen NC 801 south of US 158 to Peoples Creek Road from a two lane to a four lane divided facility.



Davie County *Transportation
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3 INTERCHANGE
FEASIBILITY

Introduction

The Interstate System was established to provide efficient movement of motor vehicles, both civilian and military, over long distances within and between States. However, since its development, the strategic role for which the Interstate system was conceived to facilitate, has dramatically expanded. While the core purpose of the Interstate system is still the movement of both freight and people efficiently and safely, it has expanded to not address a broad range of issues including intermodal connectivity, economic development, and commuter traffic.

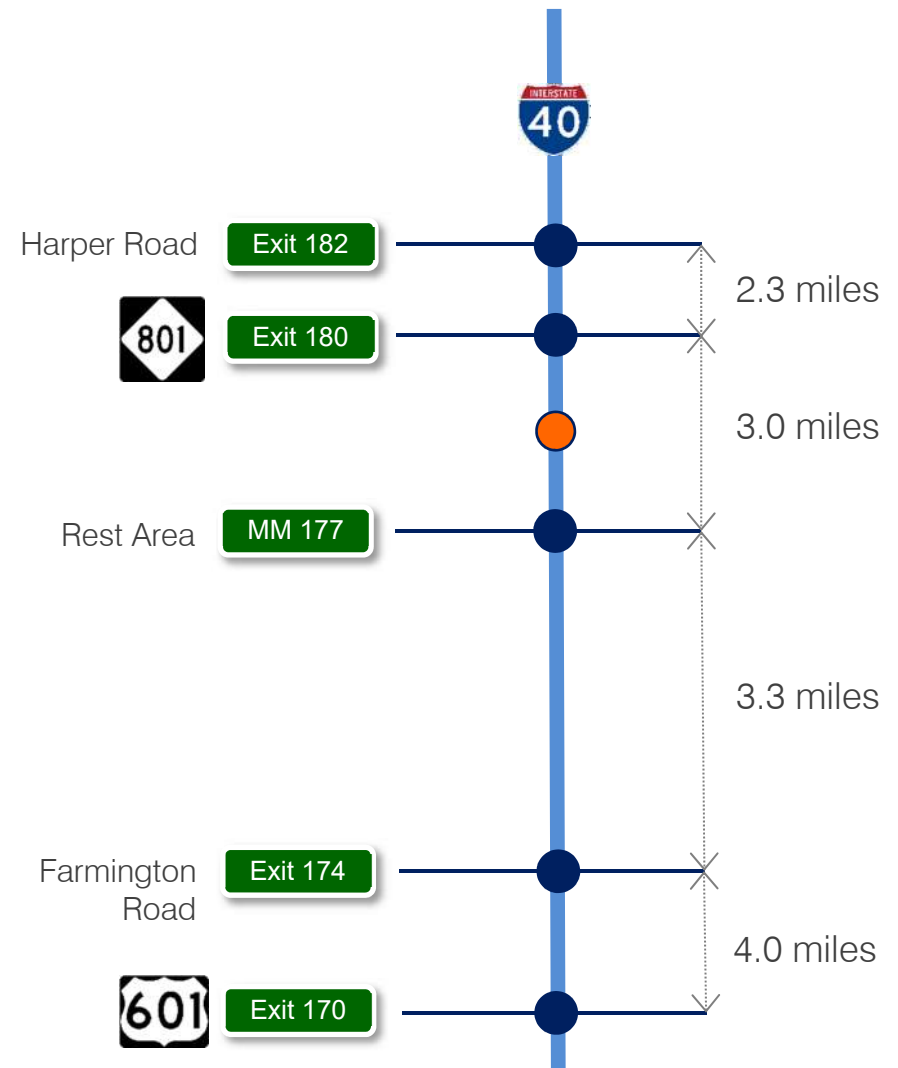
In Davie County, I-40 is required to facilitate these same roles; movement of commuter traffic into and out of Forsyth County, movement of freight through the region and between States, and facilitate local trips within the community. Since the county line between Davie and Forsyth Counties occurs along the Yadkin River, the I-40 crossing of the river carries a higher percentage of "local" trips since it is one of two crossings within the area, the second being US 158. Because of this, I-40 within the study area takes on a different role than other Interstates may take on.

North Carolina Department of Transportation (NCDOT) Project Development and Environmental Analysis Unit has developed guidance for the development of Interchange Justification Reports (IJR) to outline a consistent methodology for their development. The Federal Highway Administration (FHWA) has review and approval authority for all new access points to the Interstate system. FHWA's has developed eight (8) criteria points that must be addressed with any change in access. These eight criteria are summarized below and discussed in detail later in this chapter.

1. Need for access cannot be met by the existing Interstate interchanges;
2. Reasonable system management techniques (ramp metering, mass transit, HOV/HOT,) and geometric changes address the need;
3. No adverse impact on the existing Interstate and interchanges by the proposed access;
4. Proposed access connects to a public facility;
5. Access proposal is consistent with local and regional land use and transportation plans;
6. Comprehensive evaluation of the corridor is required in locations where multiple interchanges are possible;
7. Coordination with proposed transportation system improvements;
8. Proposal for access must be developed concurrently with the environmental evaluation.

Area Overview

As mentioned previously, within the immediate study area there are two standard interchanges with I-40. NC 801 (Exit 180) and Farmington Road (Exit 174). In between these two interchanges with I-40 is the rest area at MM177. While not an interchange with a surface street, it does operate in the same manner as the interchanges with Farmington Road and NC 801 and should be considered an interchange. The graphic to the right depicts the interchange spacing within the study area as well as one interchange on either side.



Interchange Spacing

Per AASHTO guidance, the following interchange spacing is offered as a recommendation for both urban and rural areas. The guidance is as follows:

Interchange Spacing	
Urban	Minimum: 1 mile
Rural	Minimum: 3 miles

In review of the study area it does not fall directly into the either of these two categories. More appropriately would be to classify this area as suburban as there are elements of urban (e.g. Kinderton, Kinderton Town Center, etc.) and rural such as the area in the western portion of the study area near Farmington Road.

Another consideration for the classification of urban or rural is the growing concentration of industrial, warehousing, and distribution space within the study area. Currently at 3.4 million square feet, Ashley Furniture has the potential to add another 1 million square feet of industrial space to its facility. At this size facility, approximately three to four thousand employees over variable shifts would be employed, based on discussions with Ashley Furniture.

When considering the concentration of industrial development and the other development that will continue to occur based on this investment in the community and the continued growth of the area, the area is going to continue to evolve from a suburban context to an urban area.

The average interchange spacing was determined for the study area. While not a criterion required by FHWA, it does provide a good measure for the number of interchanges along a section of interstate. This process included determining the distance between adjacent interchanges within the study area.

Several spacing scenarios have been examined to determine the average spacing along this section of I-40. Those include:

1. Exit 182 (Harper Road) to Exit 170 (US 601) – without a new interchange
2. Exit 182 (Harper Road) to Exit 170 (US 601) – with a new interchange
3. Exit 180 (NC 801) to Exit 174 (Farmington Road) – without a new interchange
4. Exit 180 (NC 801) to Exit 174 (Farmington Road) - with a new interchange

The average spacing for each of these scenarios is shown to the right.

Exit No.	Distance	New Interchange	No. Of Interchanges	Average Spacing
182 to 170	12.6 miles	No	5	2.5/mile
182 to 170	12.6	Yes	6	2.1/mile
180 to 174	6.3	No	3	2.1/mile
180 to 174	6.3	Yes	4	1.6/mile

Should a new interchange be constructed, the average spacing between Exit 180 and 174 would be 1.6 interchanges per mile. When the adjacent two interchanges on each side of the proposed interchange is considered, the average spacing increases to 2.1 interchanges per mile.

FHWA Criteria

The Federal Law Section 111 of Title 23, United States Code (23 USC 111) requires that proposed new or revised Interstate access must be approved by the FHWA before such access modifications can be made. ***The FHWA policy (98-3460) states: It is in the National Interest to maintain the Interstate Highway System to provide the highest level of service in terms of safety and mobility. Adequate control of access is critical to providing such service.*** This study addresses the policy requirements for new or revised access points to the existing Interstate system published in the *Federal Register Volume 63 Number 28 February 11, 1998 (Doc. 98-3460)*:

FHWA policy states that all requests for new or revised access must include sufficient supporting information to allow FHWA to independently evaluate the request and ensure that all pertinent factors and alternatives have been appropriately considered. The Interchange Justification Report needs to address each of the following eight policy requirements listed in the Federal Register.

1. *The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily*

accommodate the design-year traffic demands (23 CFR 625.2(a))

2. *The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).*
3. *An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of*

ramps with crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

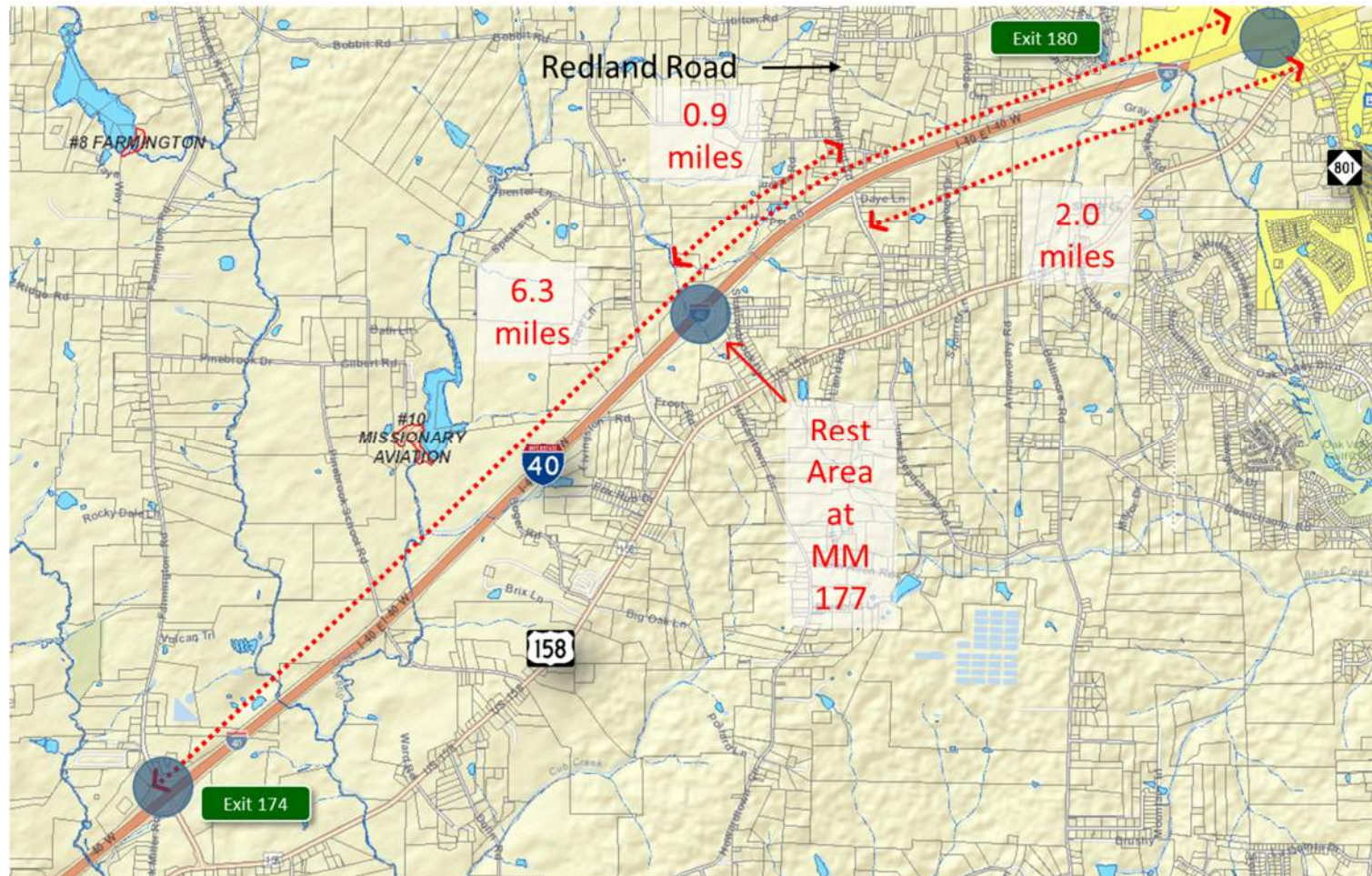
4. The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)).
5. The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.
6. In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d),

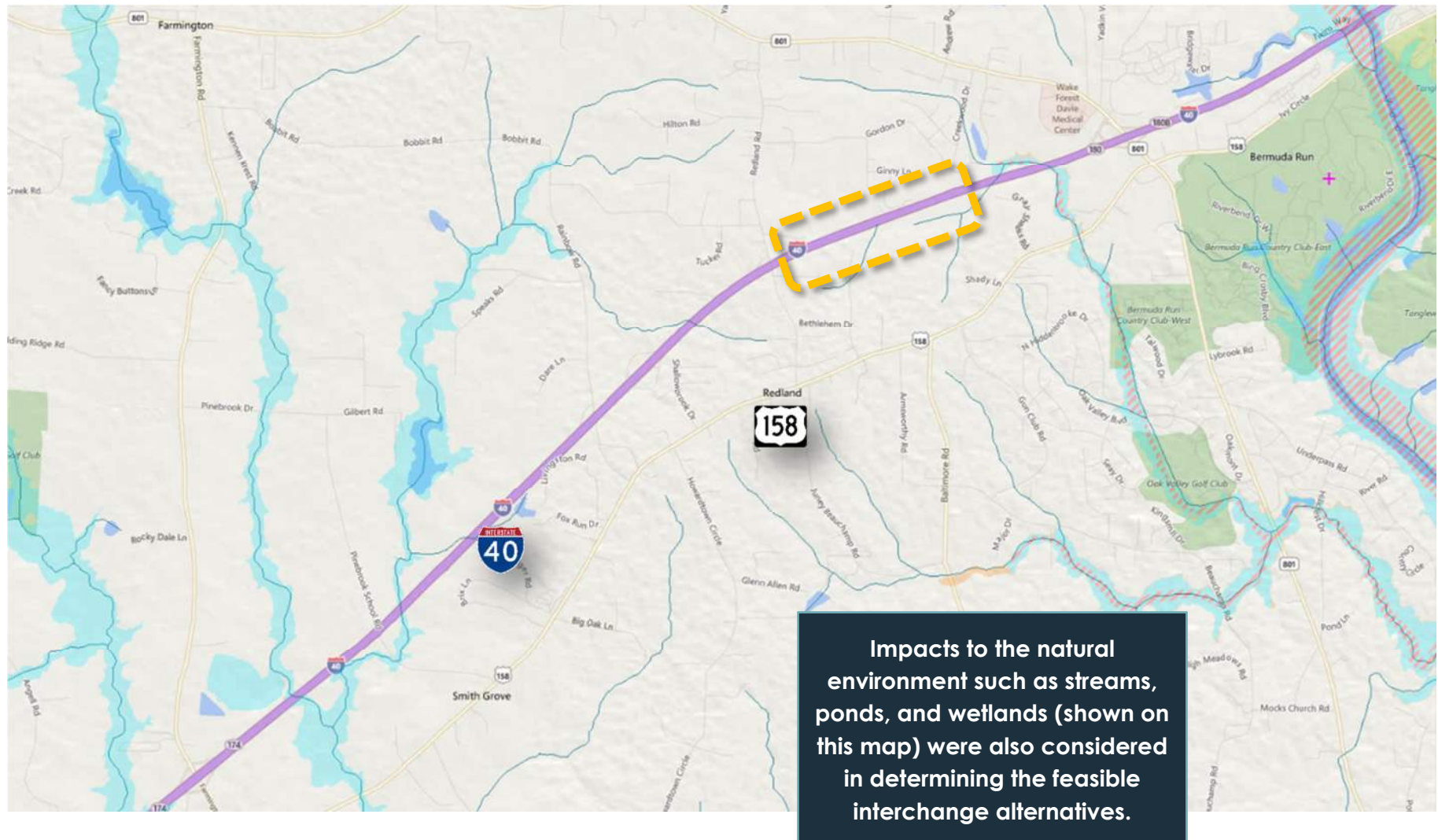
23 CFR 625.2(a), 655.603(d), and 771.111)

7. When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).
8. The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).

Feasible Interchange Area

Within the study area that would be most conducive to a new interchange along this section of I-40 east of Redland Road and west of the Exit 180 NC 801 interchange. These two points are currently separated by approximately 2 miles. With a minimum spacing criteria of 1 mile, this section offers adequate spacing for the interchange at NC 801 and the rest area just west of Redland Road. The graphic to the right depicts the infrastructure features along I-40 within the study area.





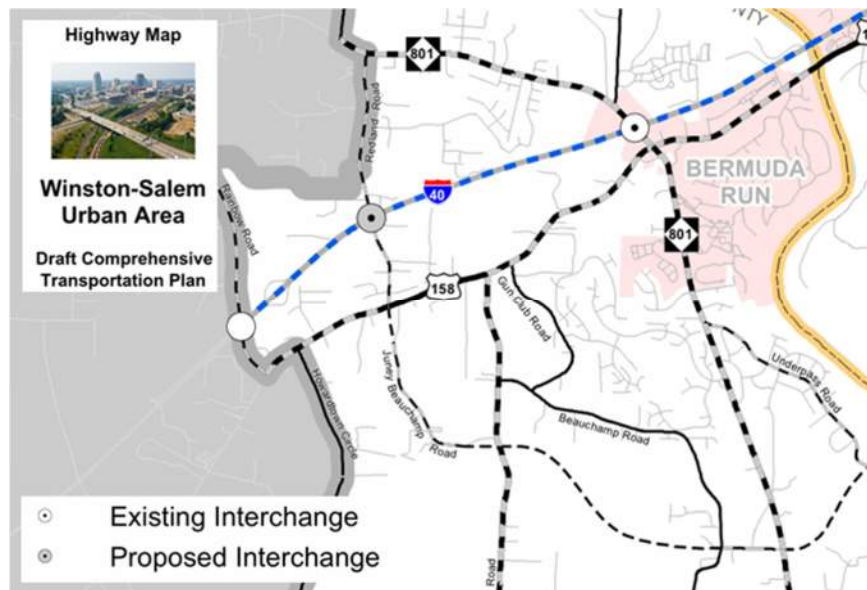


The graphic to the left depicts the 1 mile segment that is most conducive for a new interchange with I-40. This segment was selected due to:

- Its minimal impacts to the existing built environment
- Connectivity to Baltimore Road
- Minimal environmental impacts
- Interchange spacing along I-40
- Proximity from existing homes and historic structures.
- Existing overpasses

The Winston-Salem Urban Area Comprehensive Transportation Plan proposes a new interchange between Redland Road and I-40 as shown below. It is important to note that this location does fall within the optimal location for a new interchange with I-40. As the feasibility study was developed, both locations for a new interchange (Redland Road or extension of Baltimore Road) were evaluated.

The Table below highlights the metrics used to evaluate the two locations and ultimately determine which location was preferable for further evaluation and study.



Community Metric	Redland Road Interchange	Baltimore Road Interchange
Traffic Operations		
Reduces delay at key intersections.	●	●
Enhances safety along the US 158 corridor.	◐	●
Reduces truck traffic on US 158/NC 801 interchange	◐	●
Mobility & Access		
Provides access to key destinations in the study area	●	●
Economic Development		
Supports the viability of existing businesses and future economic development.	○	●
Built and Natural Environmental Impacts		
Impacts to Historic properties (registered or eligible)	●	○
Impacts to Existing homes	●	◐
Impacts to Streams	○	●
Impacts to Wetlands	○	○

- Satisfies
- ◐ Partially Satisfies
- Does not Satisfy

As shown in the table on the following page, both interchange locations (Redland Road and Baltimore Road) meet the primary purpose of providing improved access to I-40, west of NC 801. When considering the metrics shown on the following page, the interchange at Redland Road, while providing access to I-40, does not score as well as an interchange at the extension of Baltimore Road. Some of the potential concerns with an interchange at Redland Road include the following:

- Potential impacts to historically eligible Bethlehem United Methodist Church
- Less than one mile spacing between Redland Road overpass and the rest area to the west
- Trucks from Ashley Furniture would be required to utilize US 158 to access a new interchange on Redland Road
- Does not provide for additional development around the interchange area (economic development)
- Increases vehicular traffic on a primarily residential road (Redland Road)

For these reasons the steering committee determined that the location for further review and evaluation should occur at the extension of Baltimore Road.



Bethlehem United Methodist Church

Interchange Alternatives

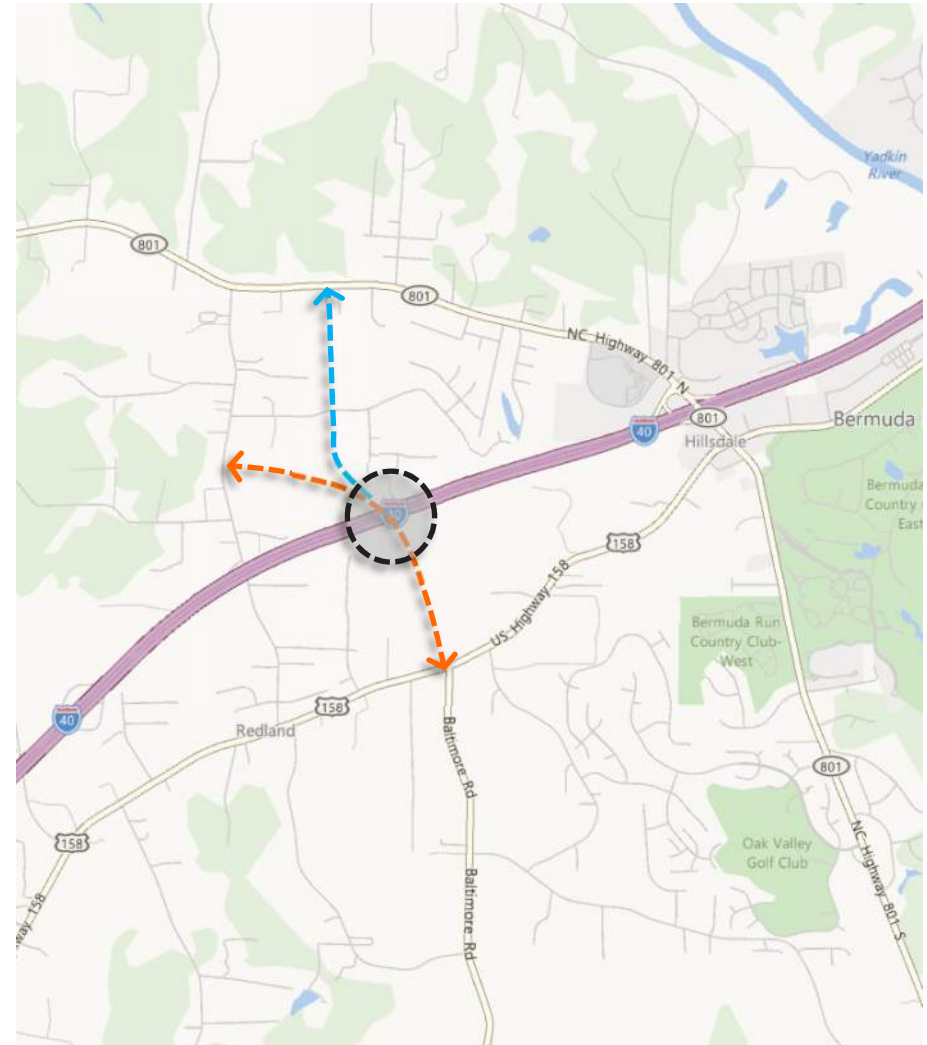
After analyzing the spacing and environmental restrictions of the future interchange, the following interchange configurations were identified as shown to the right. Each of these is graphically represented below and discussed on the subsequent pages.

- 1. Interchange between I-40 and the extension of Baltimore Road to NC 801**
- 2. Interchange between I-40 and the extension of Baltimore Road to Redland Road**
- 3. Interchange between I-40 and the extension of Baltimore Road (no northern connectivity)**



Each of the interchange configurations build upon an extension of Baltimore Road. In the initial discussions regarding a potential interchange with stakeholder and committee members, a common theme emerged. To provide enhanced access and minimize the influence of trucks on adjacent interchanges and roadways, the potential interchange needed to be located such that it reduced reliance on adjacent roadways for connectivity, beyond Baltimore Road which provides access to the Ashley Furniture facility. In addition, if possible, connectivity to the interchange should minimize the number of turning movements each truck had to make approaching the facility. This desire was to reduce the potential for conflicts with other trucks and motor vehicles.

Considering these factors, the alternatives developed quickly gravitate towards an extension of Baltimore Road as it provided a direct connection to I-40, minimized the number of turning movements that would be required of the vehicles accessing the Ashley facility, and more importantly it placed a potential interchange within the boundary for acceptable placement.



For the three interchange configurations presented, two configurations connect not only with I-40 but also to the north and west. The last configuration provides connectivity to I-40 via a new interchange, but does not connect to the north (NC 801) or the west (Redland Road). After further discussion with committee members it was determined that connectivity to/from the north was of less importance and served through existing connections. Furthermore, by not extending Baltimore Road to the north, the number of impacted properties would be significantly reduced.

Each of the alternatives depicted on the previous pages, were evaluated against a set of quantitative and qualitative measures of effectiveness (MOE's). The evaluation was a high-level assessment focused on the elements, as shown below.

Accessibility

creates improved access to Ashley Furniture, minimizing the potential for impacts to adjacent roadways and interchanges

Impacts to Natural Features

seeks to minimize impacts and avoids encroachment, where possible, on sensitive lands and environmental features

Built Environment Impacts

minimizes impacts to existing buildings, homes, and businesses
















Driver Expectations




offers a predictable design that minimizes driver confusion and allows for ease of navigation by the driver

Operations

each alternative was developed to provide sufficient intersection capacity to handle the projected traffic with an acceptable level of service

The results of this evaluation are shown to the right. This evaluation was performed by the project team.

Criteria	1	2	3
Accessibility			
Impacts to Natural Features			
Built Environment Impacts			
Driver Expectations			
Operations			

-  Most satisfies the objective criteria
-  Moderately satisfies the objective criteria
-  Least satisfies the objective criteria

For the interchange configurations presented above, the need and purpose for this additional access with I-40 is to create an interchange that improves access for both freight and employees accessing the Ashley Furniture facility, minimizes the current heavy vehicle congestion at the adjacent interchanges, and maintains safe and efficient operations along the section of I-40 within the study area. Each of the interchange configurations (1-3) provide for an improved interface for traffic wanting to access the Ashley Furniture facility, minimizes the current heavy vehicle impact at the existing interchange (Exit 180 and Exit 174) due to the extension of Baltimore Road serving as the interchange point with I-40.

The initial evaluation phase focused on the location and connectivity of the interchange, a secondary evaluation examined the configuration of the actual interchange. Several interchange configurations were conceptually developed to assess their relative impact to the environ, two interchange configurations quickly gravitated to the top. These two are shown to the right in their original conceptual form.



Diamond Configuration

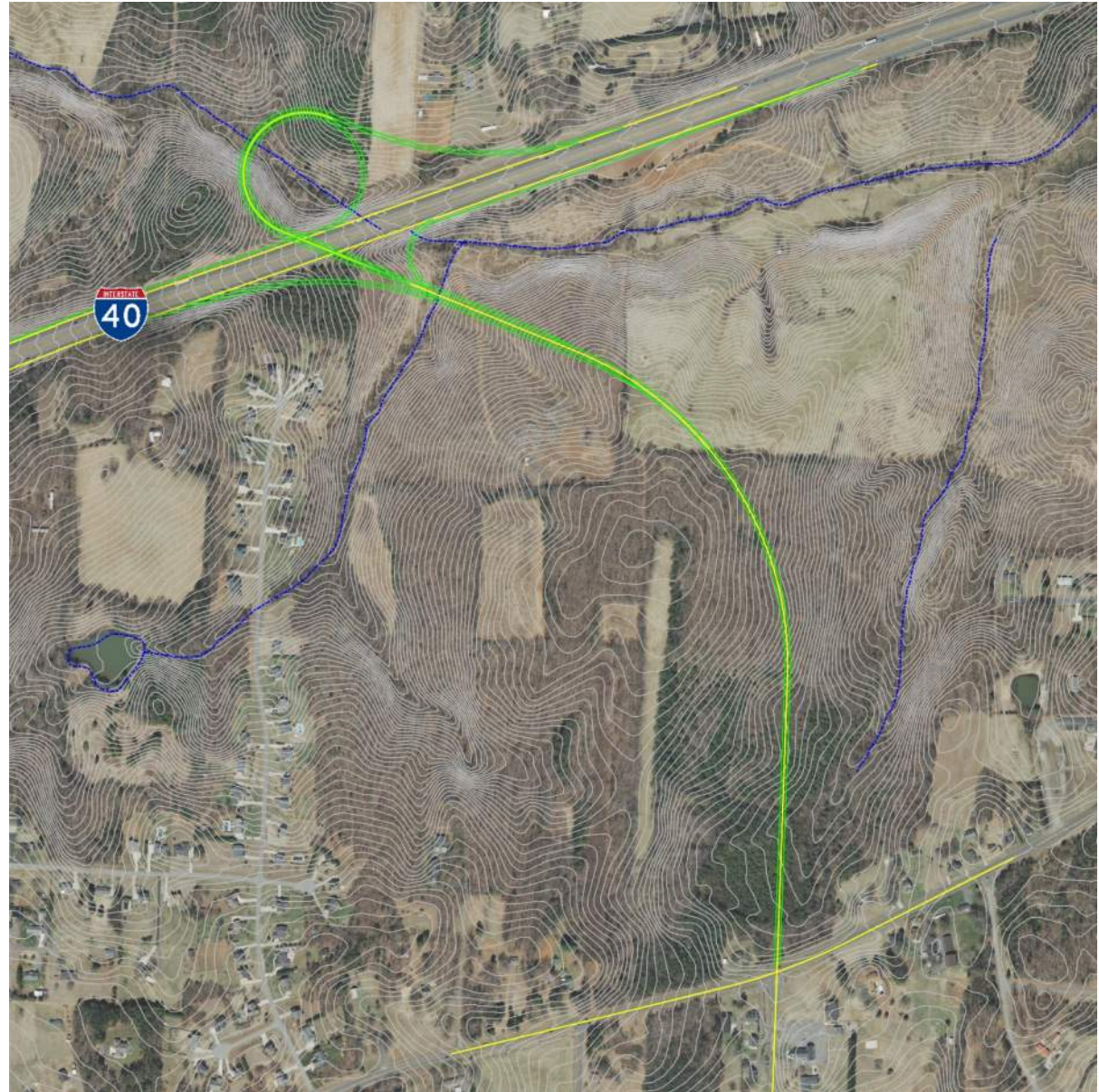


Trumpet Configuration

While both interchange configurations accomplish the desired goal of reducing the percentage of heavy vehicles using the current interchanges at Exit 180 and 174, the trumpet configuration was ultimately favored by the technical steering committee because of the following reasons:

- The configuration provided for direct (free flowing) connectivity to Baltimore Road;
- Conformed to the built environment (existing neighborhood on the south and homes to the north);
- Could be adapted/reconfigured in the future to accommodate an extension to the north if desired;
- Could be implemented in a quicker timeframe.

Based on this direction, a refined concept of the trumpet interchange was developed as shown to the right. The following page depicts the interchange with I-40.





While there was strong desire to implement the trumpet configuration, because of its ease of implementation and limited built environment impacts, there was a desire to provide greater connectivity to the north. Two options exist for improved connectivity to the north; NC 801 and Redland Road. The impacts to the built and natural environment, adaptability of the trumpet interchange configuration, and connectivity at a minimum should be considered for both. When looking at these factors the connection to Redland Road, as shown to the left, provides the desired level of connectivity to the north, minimizes the number of takings, is easily adaptable to the trumpet design, and provides a logical connection for drivers.

Interstate Analysis

The methodologies presented in the 2010 edition of the Highway Capacity manual (HCM) were used to analyze the existing traffic conditions as required by SCDOT and FHWA. The HCM was developed by the Transportation Research Board (TRB). It contains concepts, guidelines, and procedures for computing the capacity and level of service for various highway facilities, including freeways, signalized intersections, unsignalized intersections, and highways.

A freeway is defined as a divided highway with full control of access and two or more travel lanes for the exclusive use of traffic in each direction. It has no intersections; ingress or egress is provided by ramps at interchanges. The HCM states that the analysis of a freeway includes the following segments (as illustrated to the right).

Basic Freeway: Segments of the freeway that are outside the influence area of ramps or weaving areas;

Ramp: a ramp is a length of roadway providing an exclusive connection between two highway facilities. A ramp may consist of up to three geometric elements: ramp-freeway junctions, ramp roadway, and ramp-street junctions. Ramp

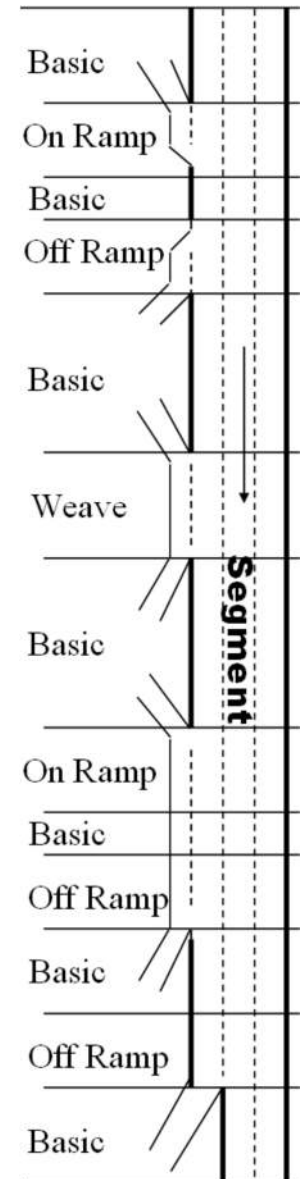
to freeway junctions are merge junctions, while the freeway to ramp junctions are diverge junctions;

Weaving: Weaving is defined as the crossing of two or more traffic streams traveling in the same general direction along a significant length of highway without the aid of traffic control devices (except for guide signs).

Weaving segments are formed when a merge area is closely followed by a diverging area, or when an on ramp is closely followed by an off ramp and the two are joined by an auxiliary lane.

As a part of this feasibility study and at the direction of NCDOT, only mainline capacity analysis has been included at this time.

Based on HCM 2010, capacity analyses were performed and levels of service were defined for each freeway segment and ramp merge or diverge



in the study area. The LOS of freeway segments is based on the density of vehicles, expressed in passenger cars per mile per lane. Six levels of services are defined for each type of facility, from A (the best) to F (the worst). These grades represent the perspective of drivers and are an indication of the comfort and convenience associated with driving.

For basic freeway segments, LOS A represents free-flow operations where vehicles can easily maneuver within the traffic stream. LOS B represents reasonably free flow, and free-flow speeds are maintained. LOS C provides flow with speeds at or near the free-flow speed of the freeway. LOS D is the level at which speeds begin to decline slightly with flows increasing and density beginning to increase more quickly. LOS E, at its highest density value, describes operation at capacity. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream. LOS F occurs when queues begin to form on the freeway due to a breakdown or bottleneck at a downstream point.

To determine the densities for the mainline freeway segments, the Basic Freeway Operational Analysis module of

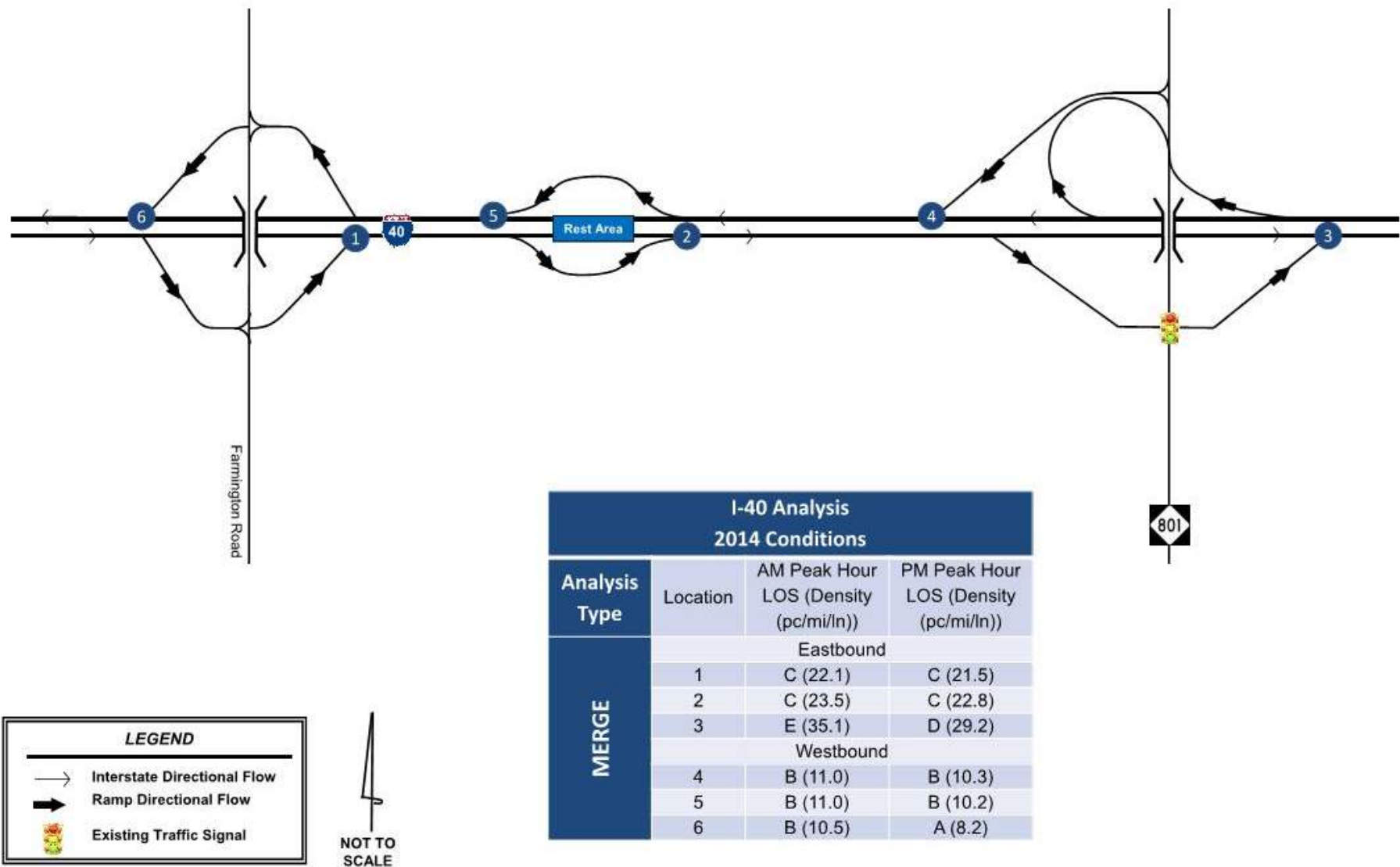
HCS 2010 was employed. Analyses of freeway mainline segments are based on the following input variables:

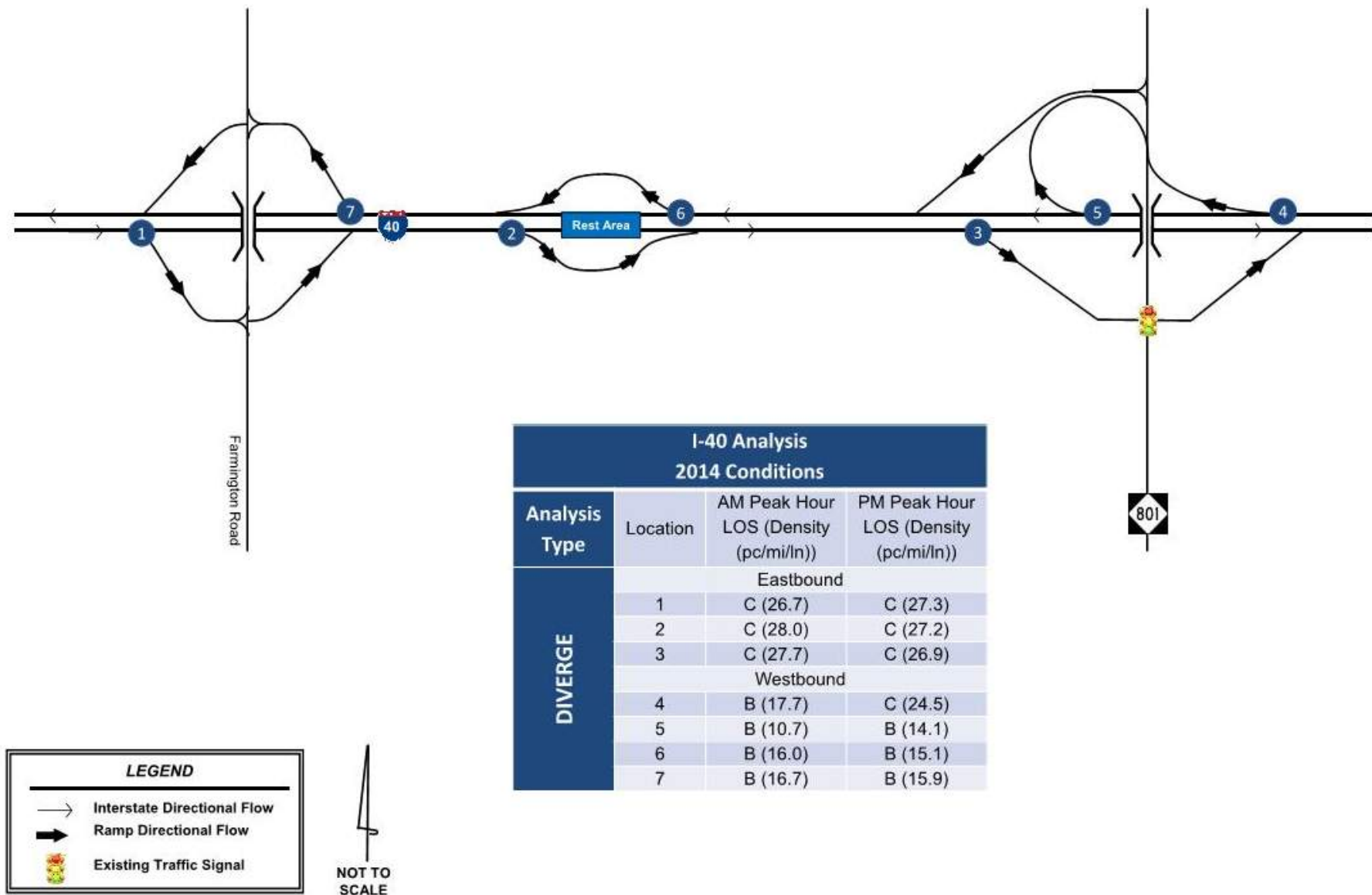
- Interstate free-flow speed
- Number of mainline freeway lanes
- Terrain (level, rolling, or mountainous)
- Heavy vehicle presence (percent trucks and buses)
- Demand flow-rate
- Peak-hour factor
- Driver population factor

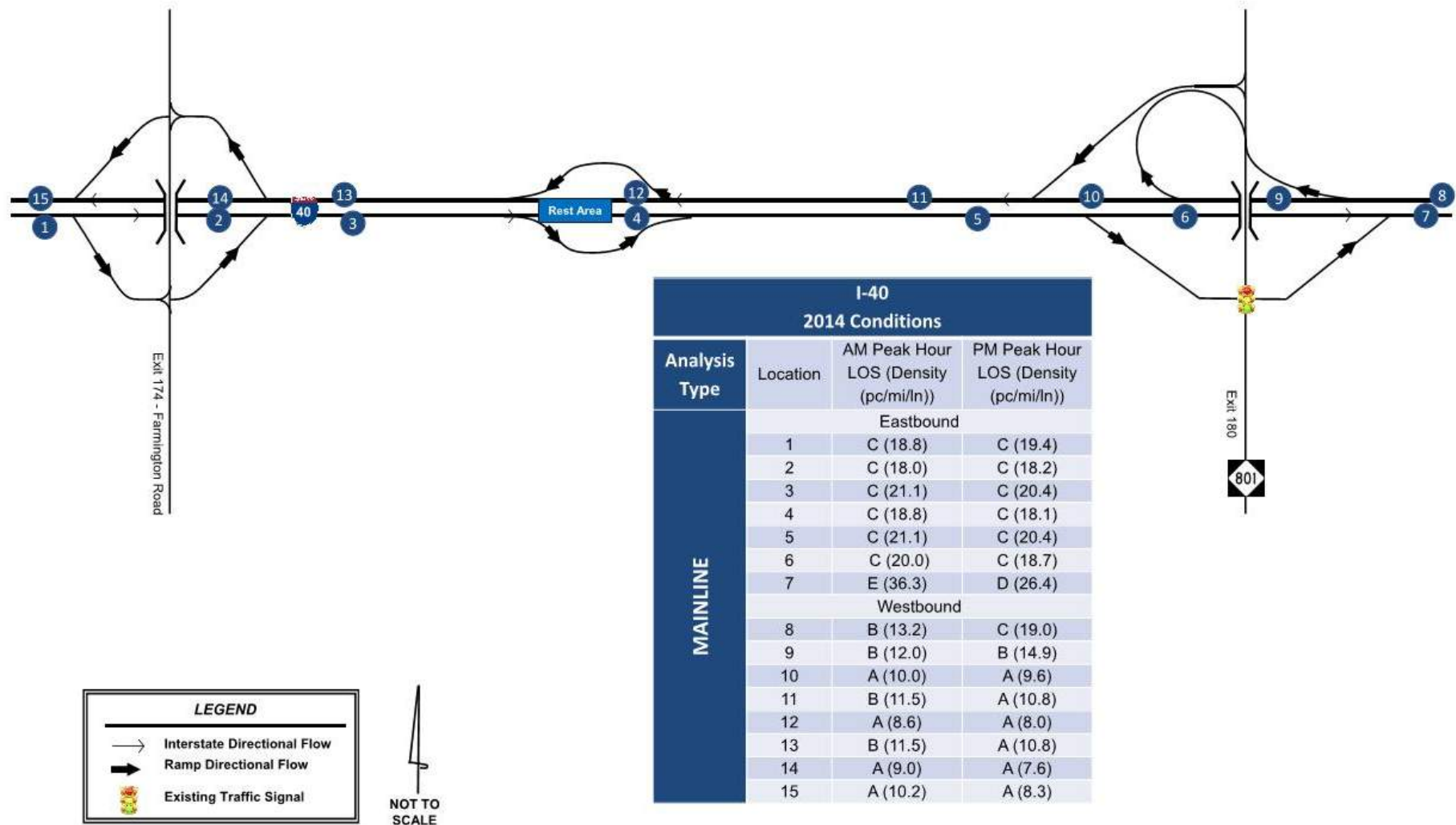
The LOS criteria for freeway segments are presented below.

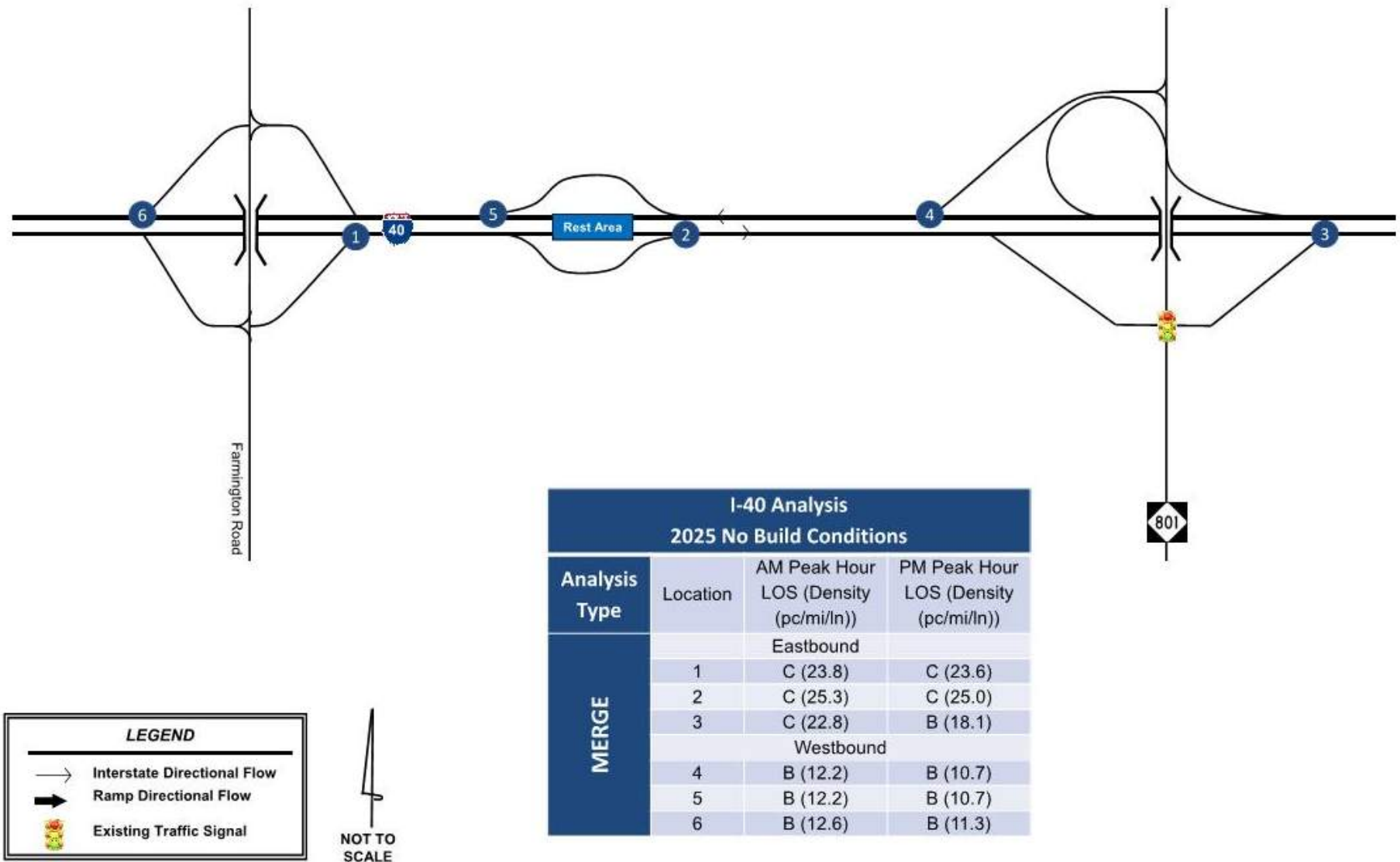
Level-of-Service Control Delay Thresholds for Basic Freeway Segments and Merge and Diverge Areas		
Level of Service	Basic Freeway Segment Density (pc/mi/ln)	Merge and Diverge Area Density (pc/mi/ln)
A	0 – 11	≤ 10
B	> 11 – 18	> 10 – 20
C	> 18 – 26	> 20 – 28
D	> 26 – 35	> 28 – 35
E	> 35 – 45	> 35
F	> 45	Demand Exceeds Capacity

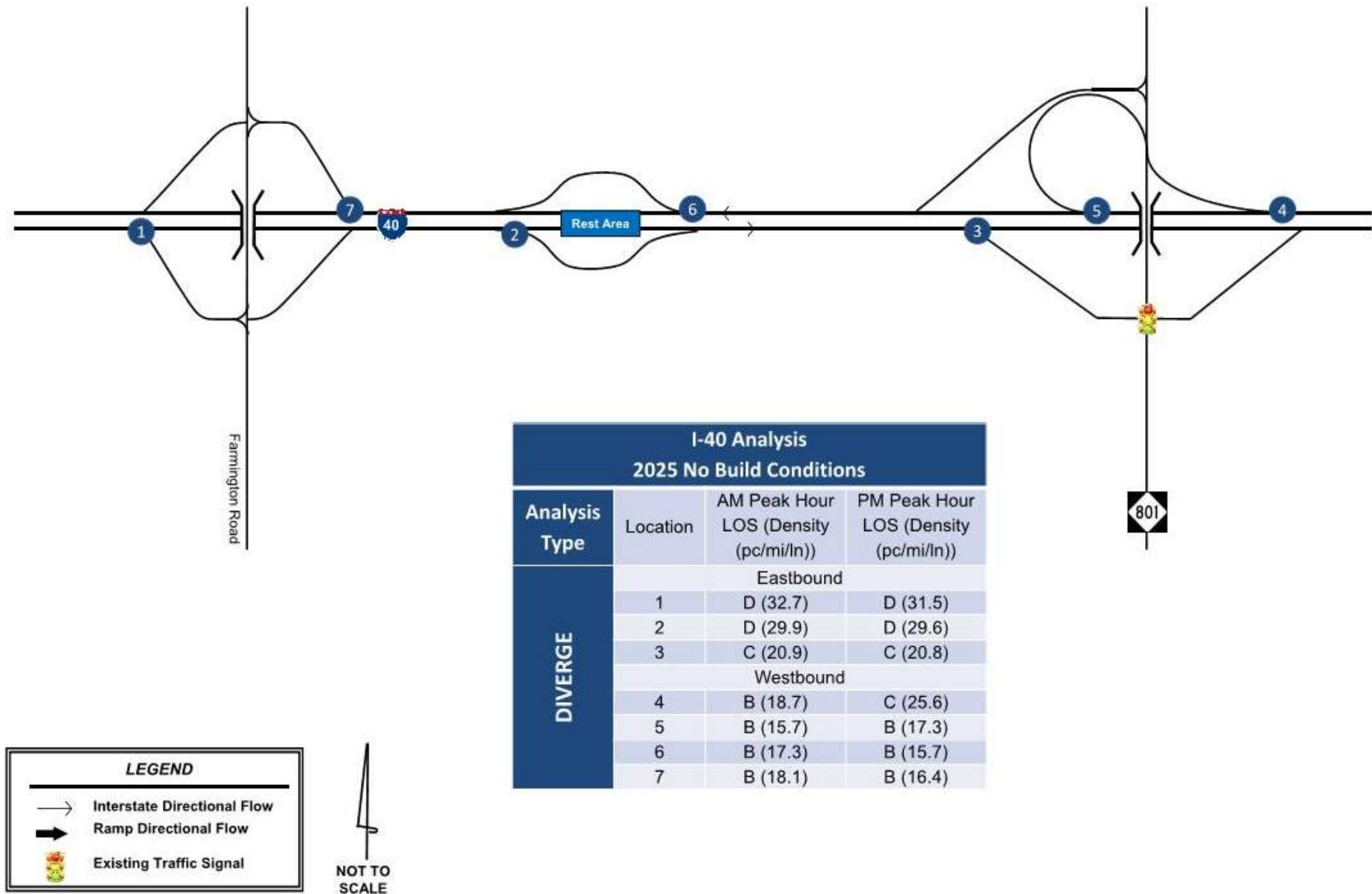
Freeway operations are presented on the following pages for existing, 2025, and 2040 horizon years.

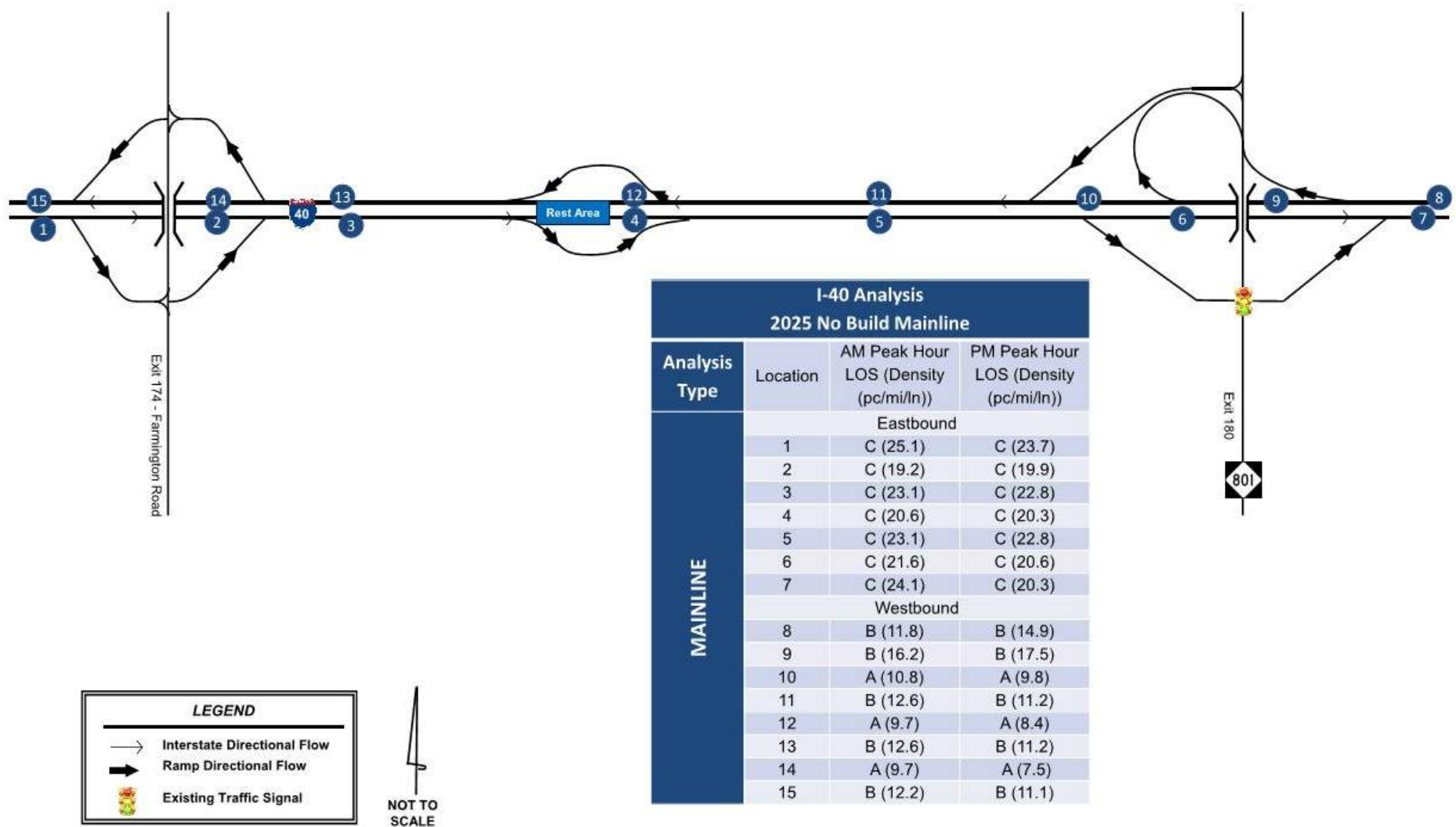


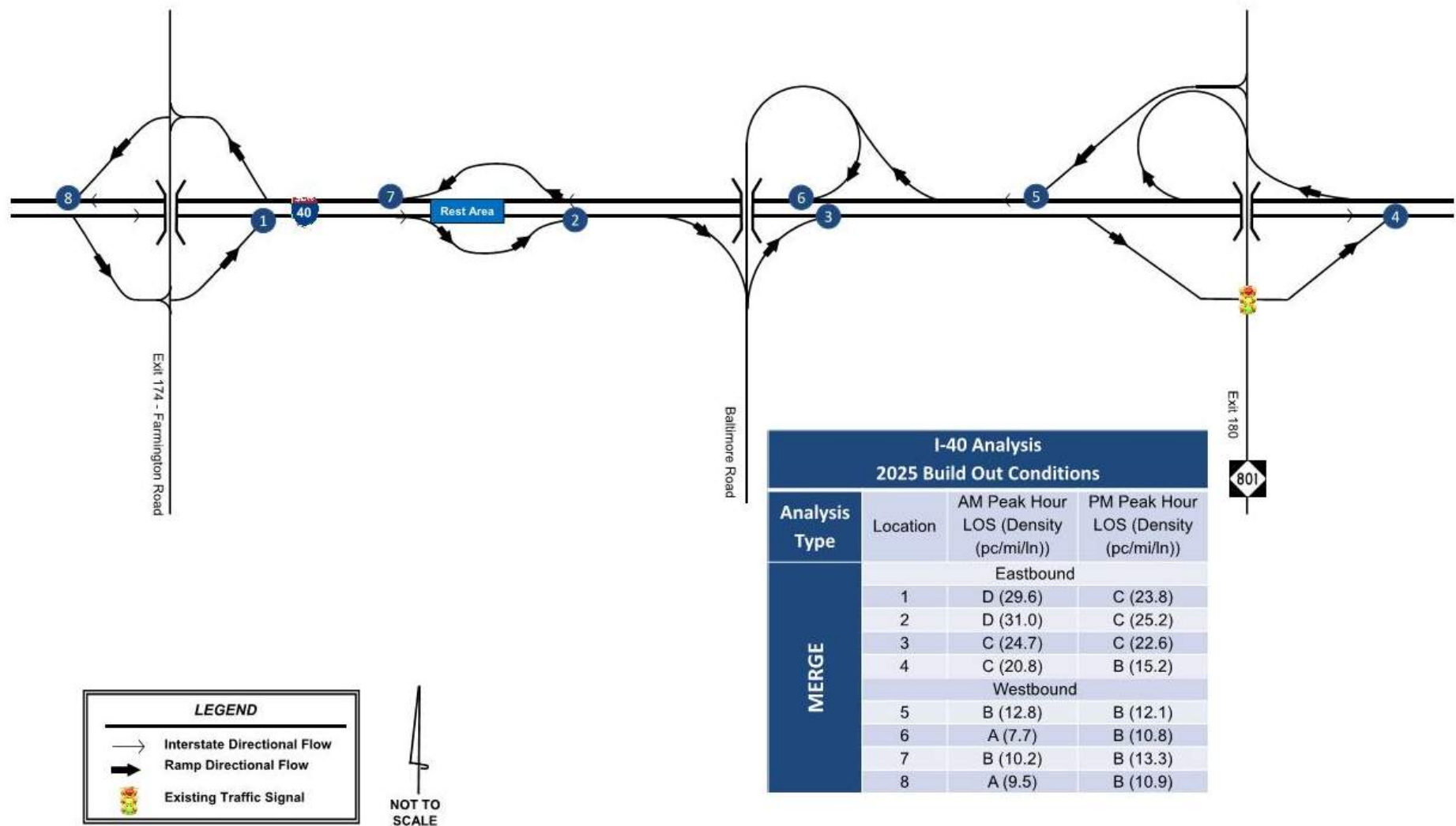


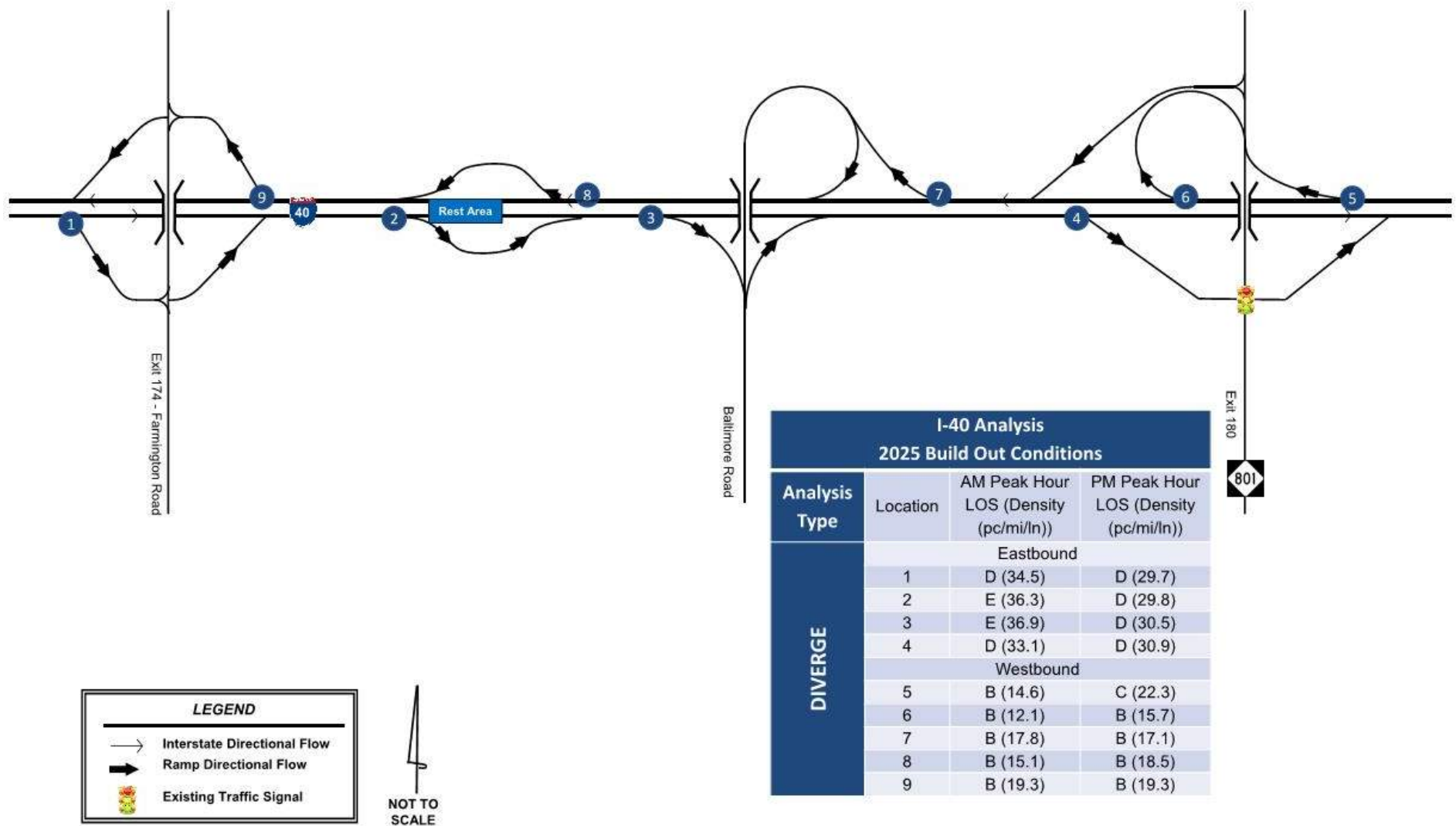


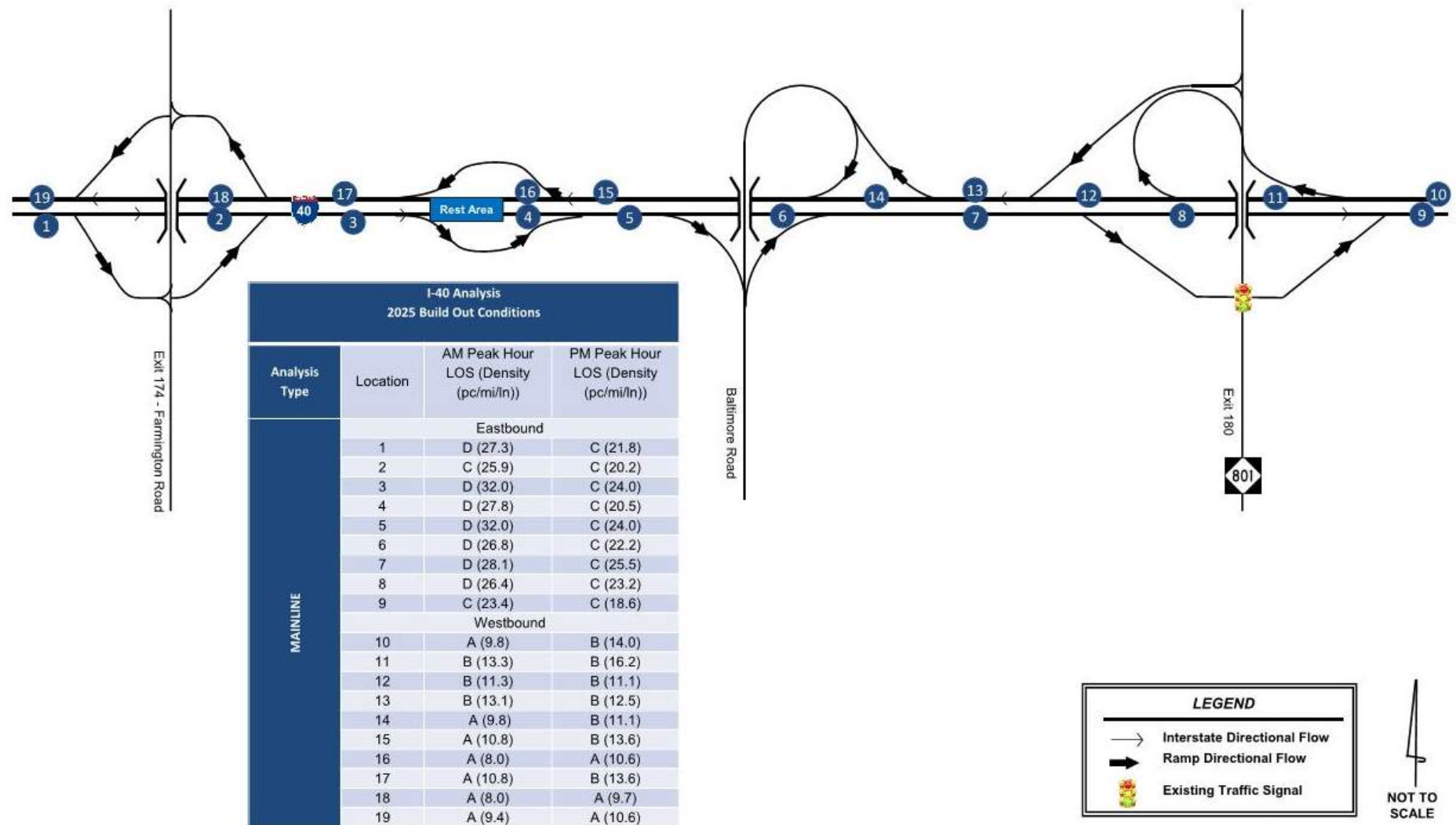


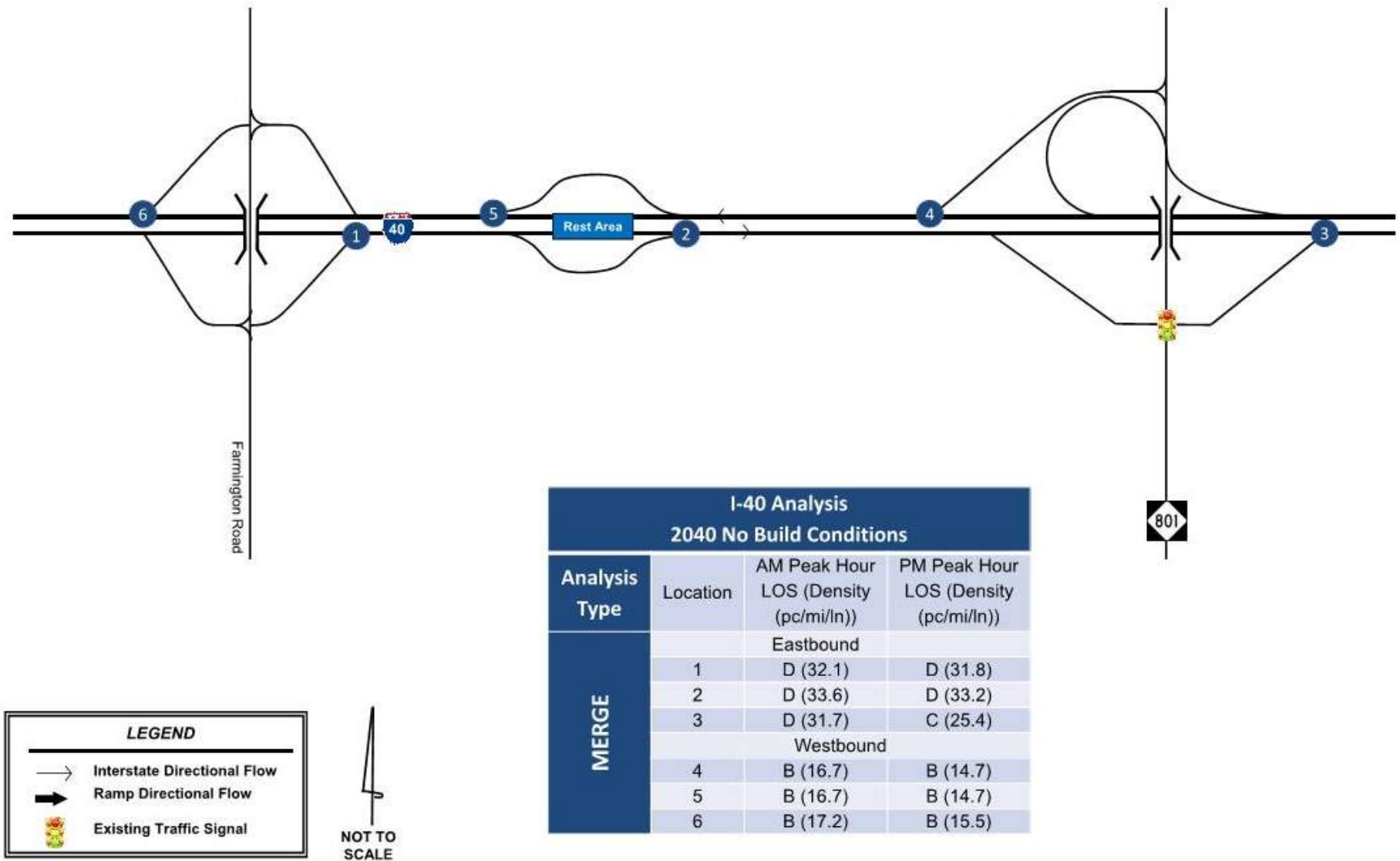


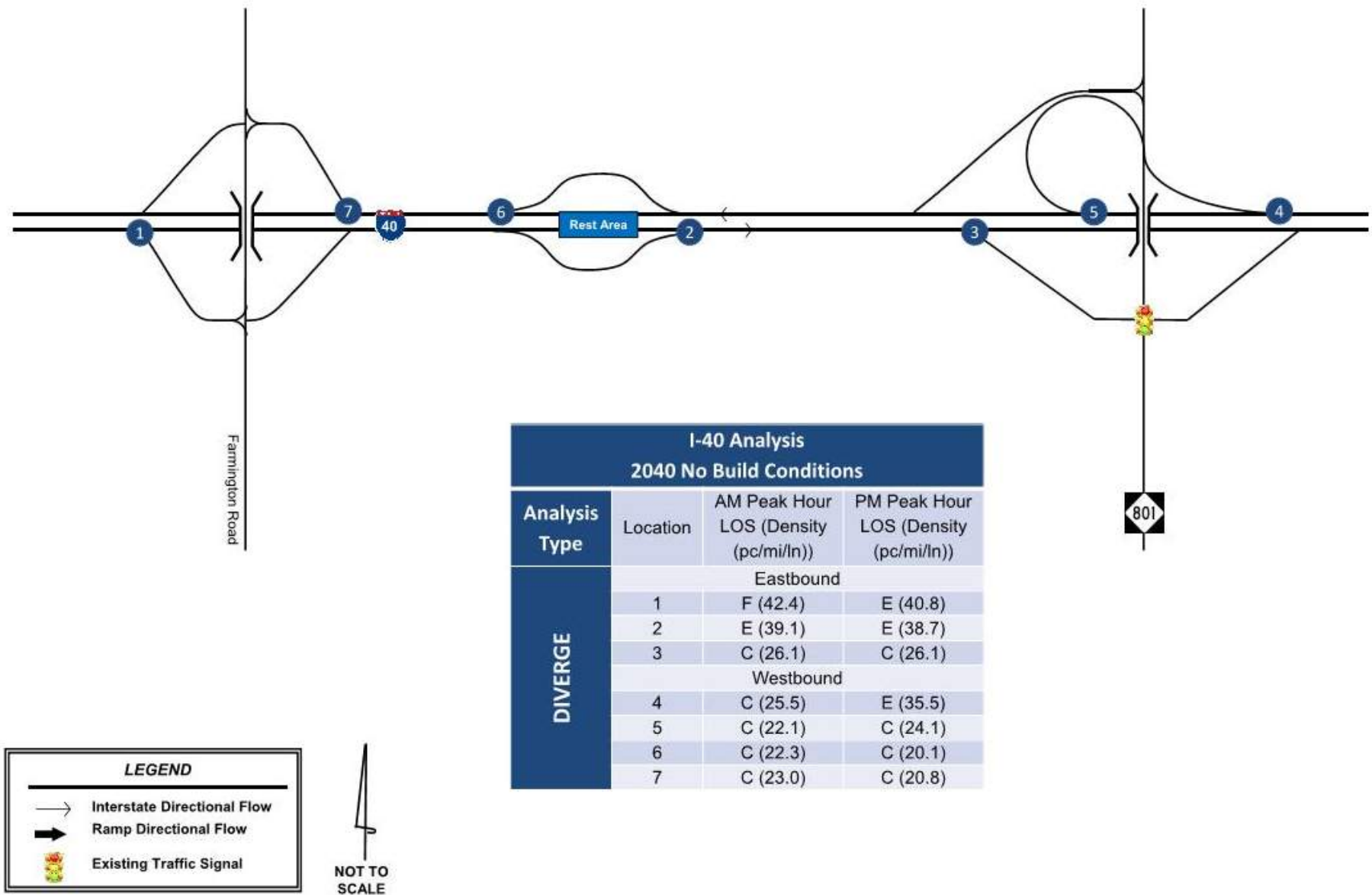


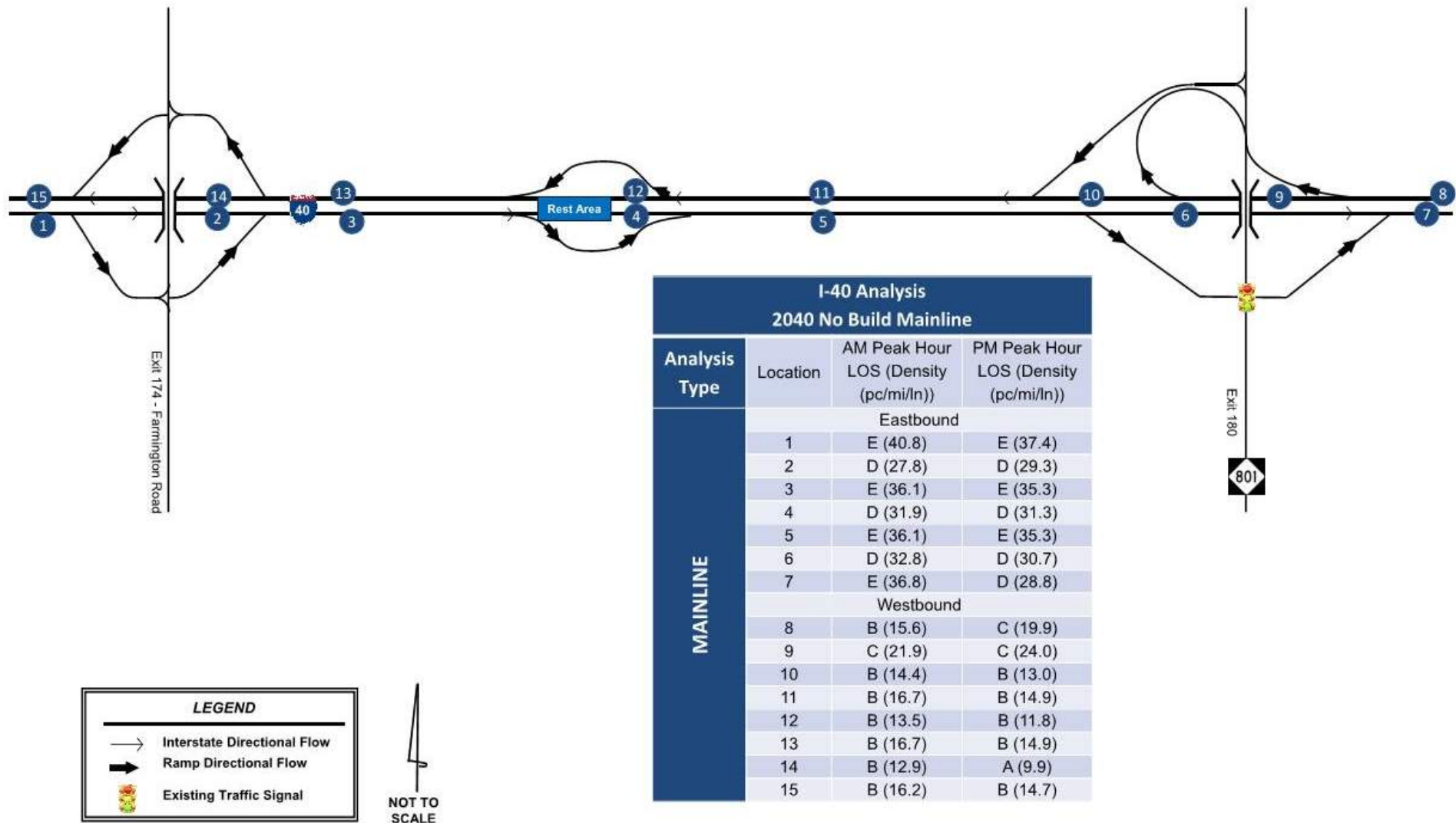


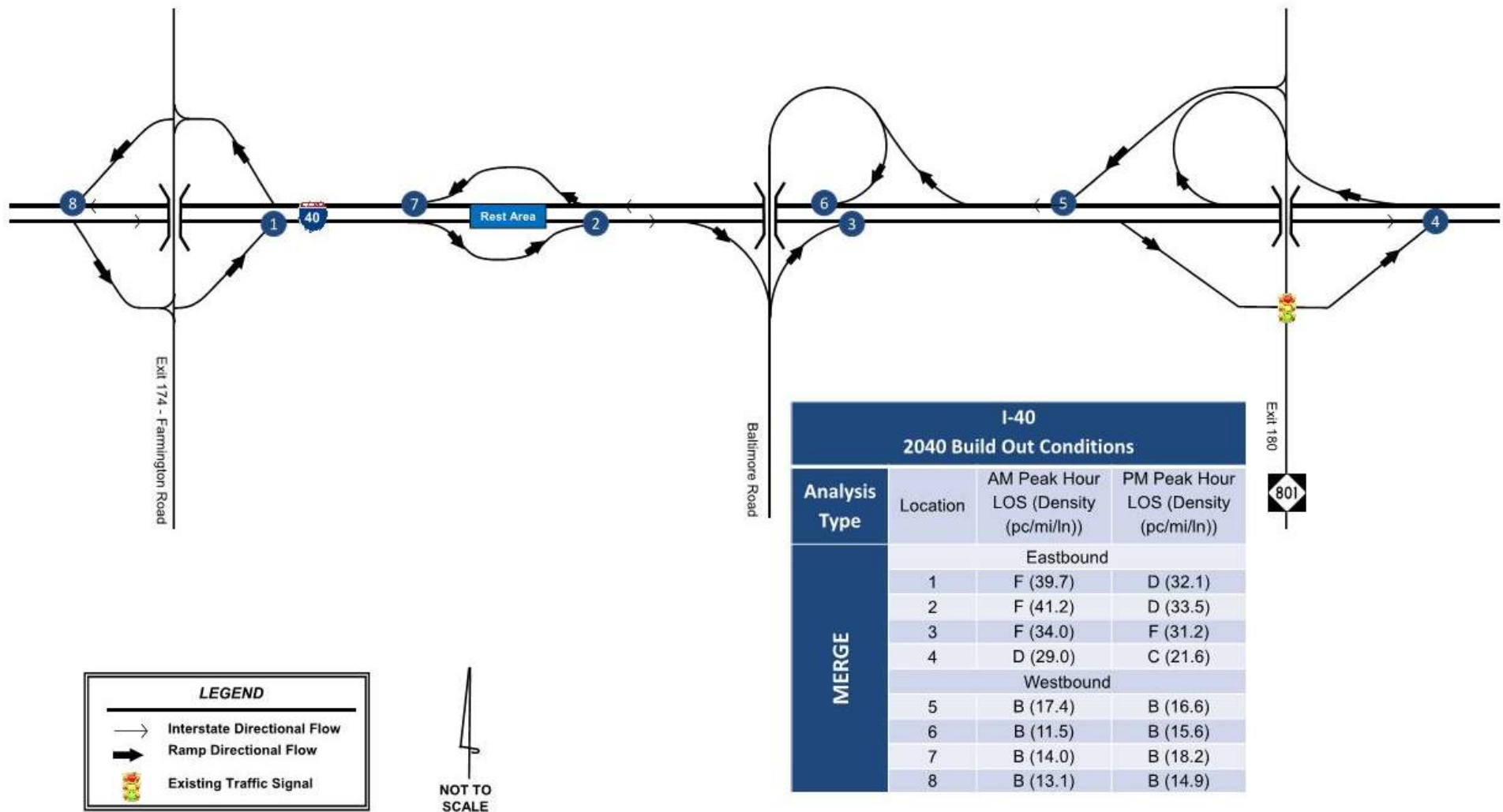


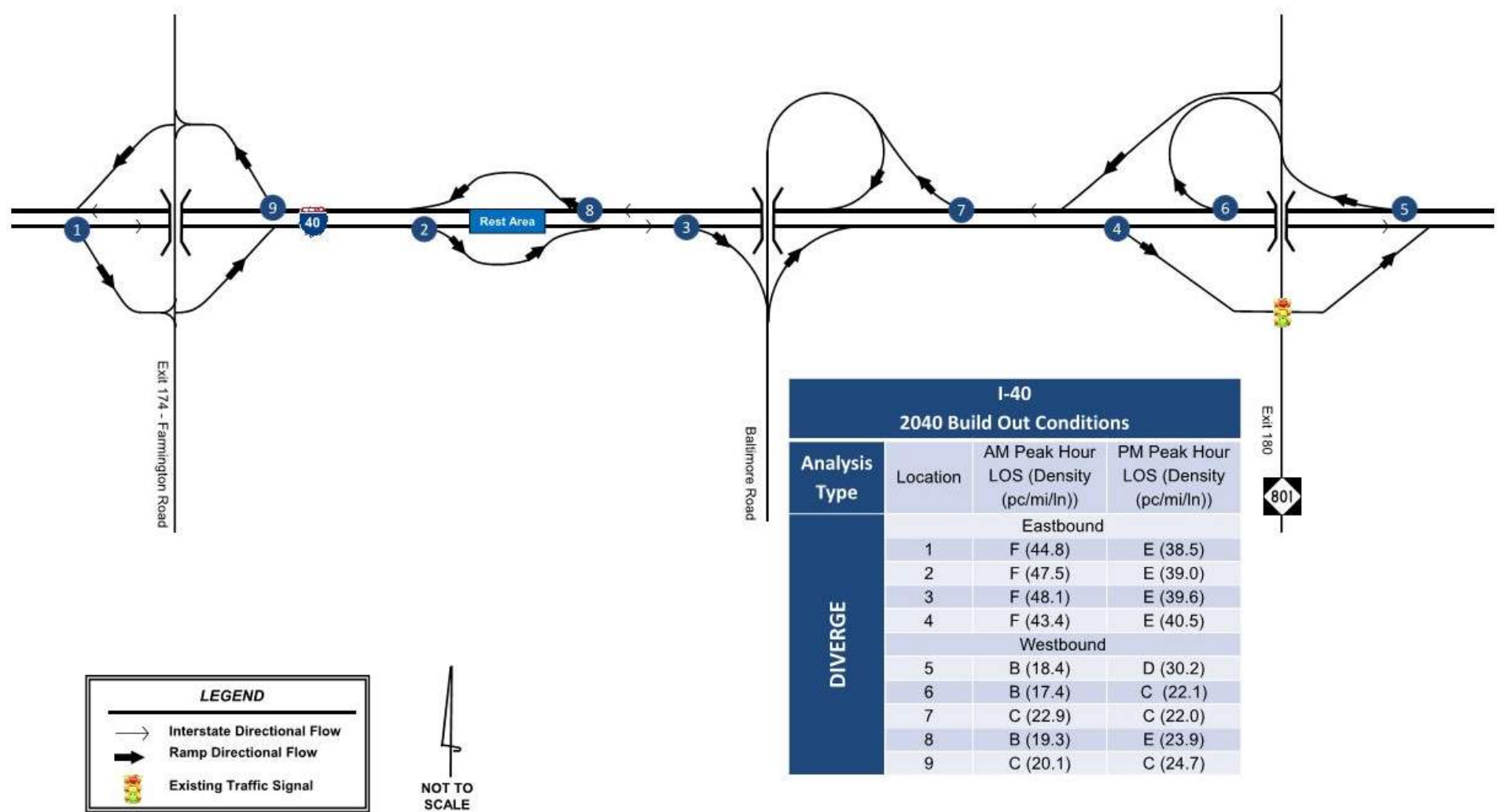


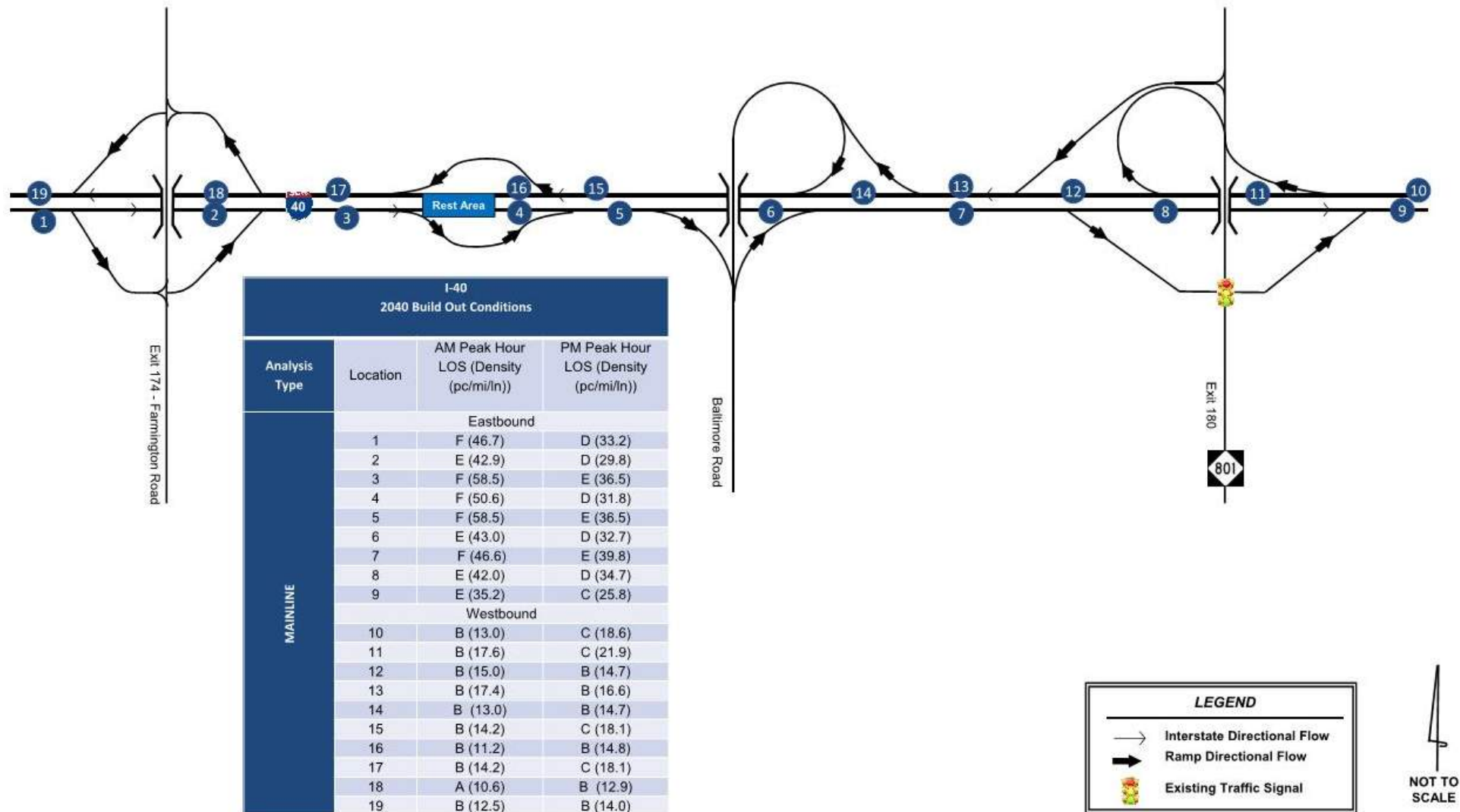


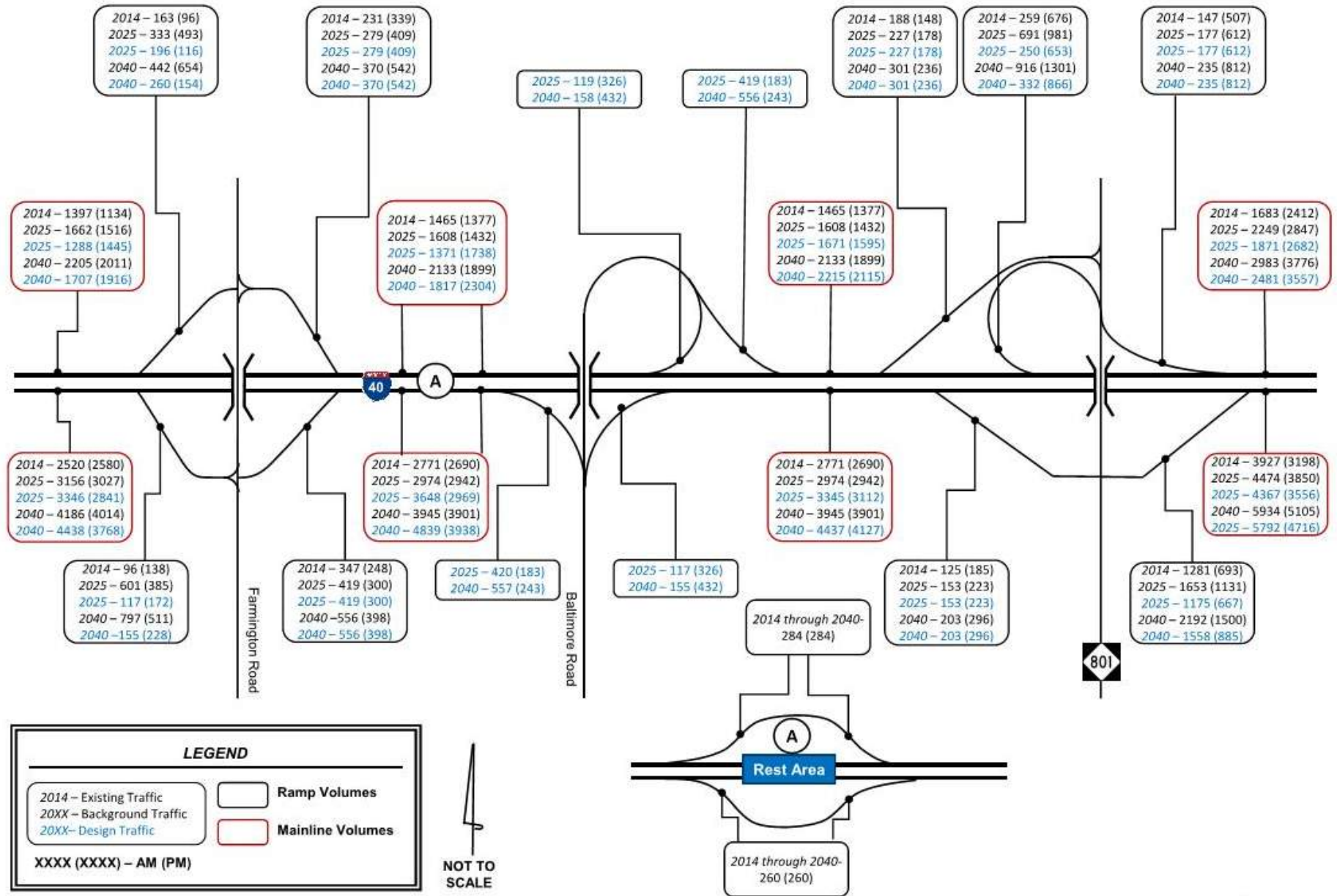


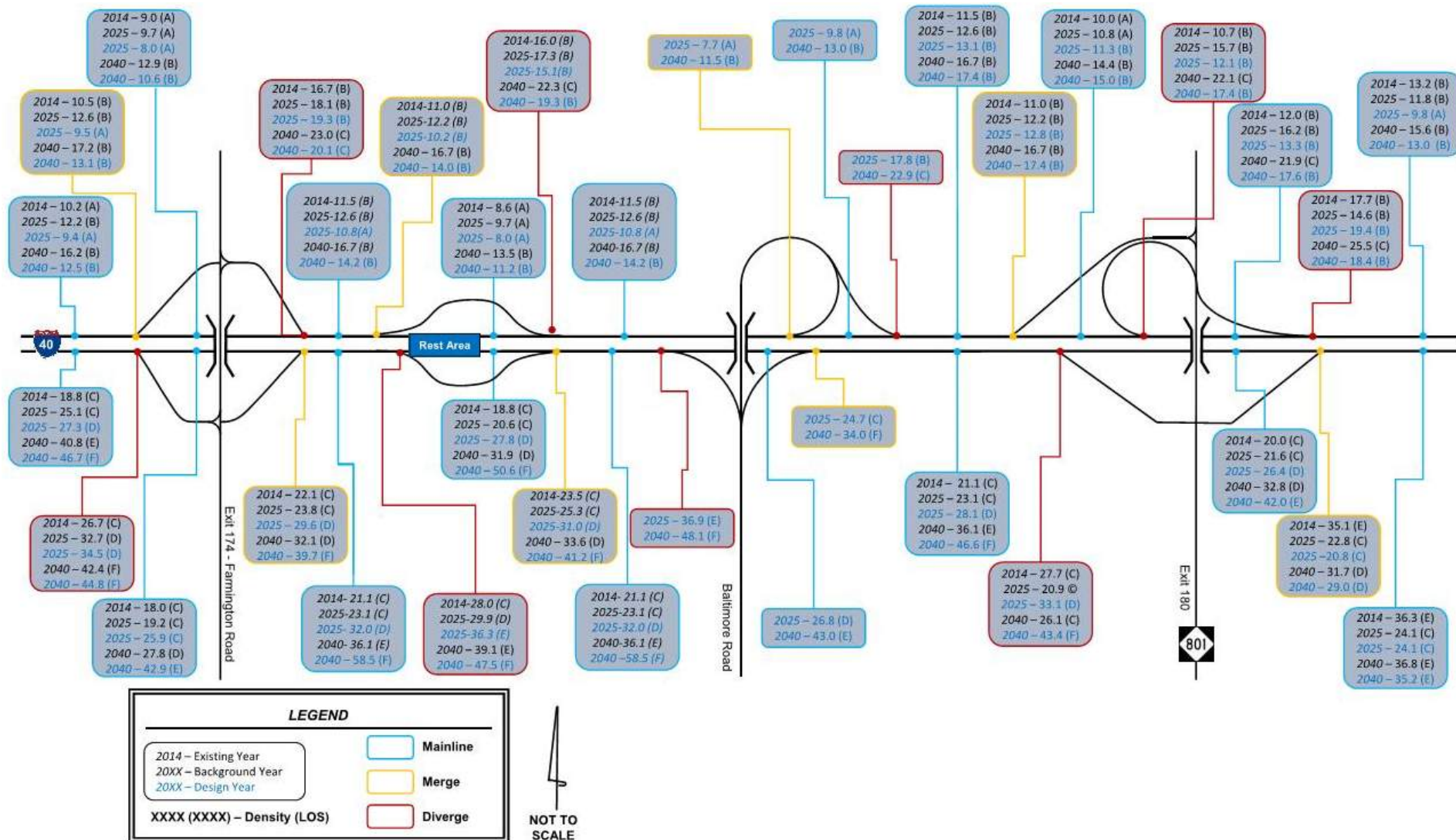


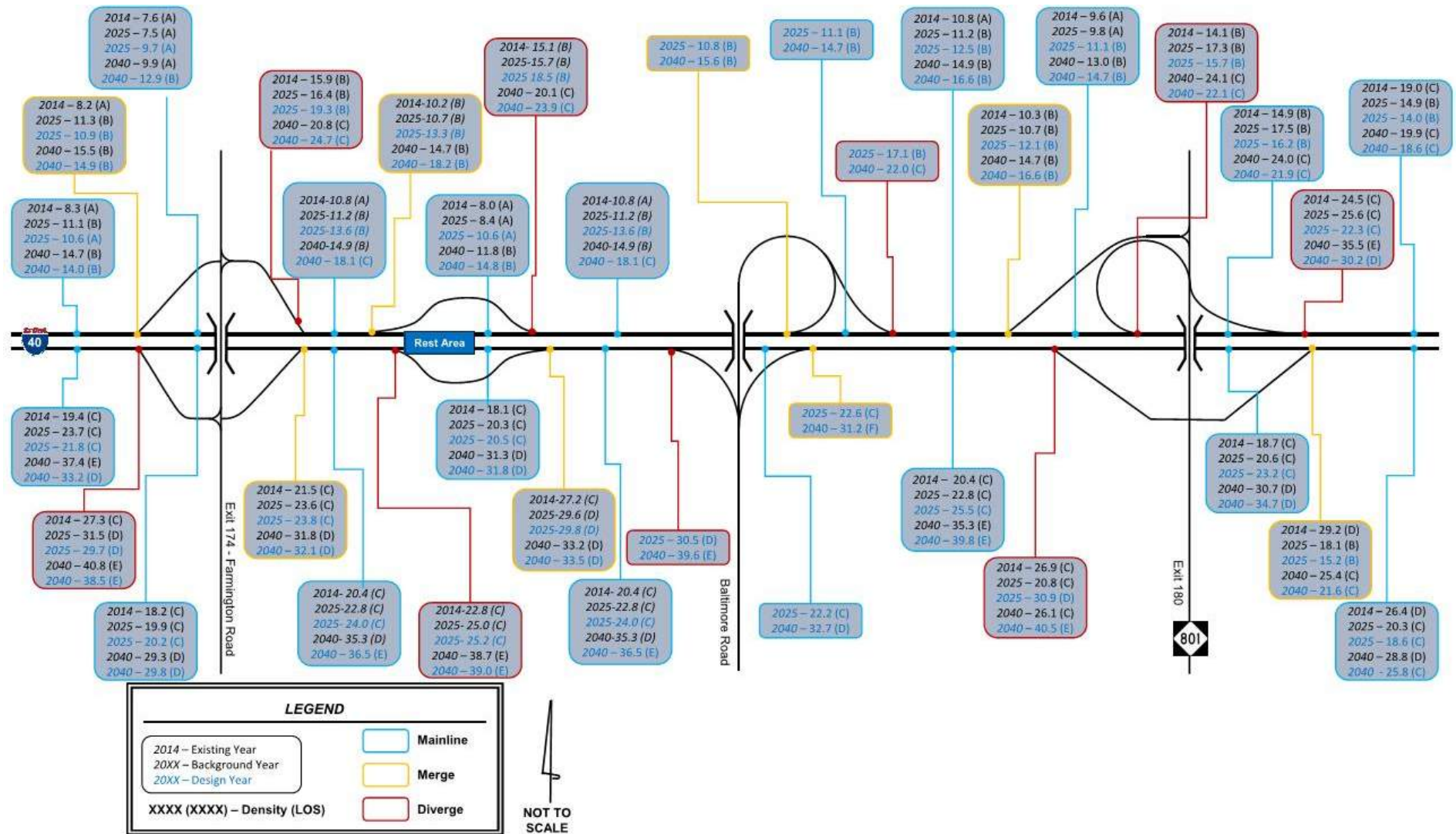












It is important to note that the Piedmont Triad Regional Travel Demand Model current ends at the NC 801 interchange with I-40. Based on a review of the regional travel demand model, a 1.9% growth rate was used to create the 2025 and 2040 horizon year volumes for the study area. This growth rate was determined based on coordination with stakeholders, NCDOT division staff, Davie County staff, and historical count data. Since the development of growth rate for the analysis, NCDOT has revised the growth rate for this area to 1.0% per year. Given the planned localized growth associated with Ashley Furniture, Wake Forest Baptist Health Davie Medical Center, and other ancillary growth, the 1.9% growth rate is a likely expectation for the area contained within the study area.

For each of the alternatives presented earlier, the purpose of a new interchange with I-40 would be to reduce the concentration of truck traffic on the existing interchanges with I-40 as well as US 158. A new interchange, regardless of the interchange type (diamond, trumpet, clover leaf), has the greatest potential of fulfilling this core purpose if the interchange is located at the extension of Baltimore Road. Locating an interchange at another location will reduce truck volumes at the two existing interchanges with I-40, but

will most likely not decrease truck volumes on US 158 and could increase the percentage on other adjacent streets. This overall reduction of truck volumes will allow for an improvement in overall operations at the two existing interchanges.



4 TRANSPORTATION STRATEGIES

Davie County *Transportation
Alternatives Feasibility Study*

Introduction

For many residents and commuters in eastern Davie County, the continued growth this area has experienced over the past 10 years is showing its impact on the community's roadway network. The challenges facing this community are not just limited to mobility for vehicles. Like many communities, the desire for active modes of transportation from the residents of eastern Davie County is growing. Many residents are looking for alternative ways to make localized trips without the need for a motor vehicle. Throughout the planning process, stakeholders and residents noted the need for improved bicycle and pedestrian amenities, particularly along the NC 801 corridor.

The transportation strategies discussed in this chapter, represent a balanced approach to serving all travel modes. These strategies are a result of community involvement, staff engagement, stakeholder interviews, analysis, comprehensive planning and transportation engineering. Specifically, this chapter communicates a plan to improve safety and mobility for the existing roadway network and key roadway intersections.

The community played an integral part in the development of this strategy. Their local knowledge offered a collective insight that if overlooked, could have potentially minimized the success of this strategy. Using this insight, a series of transportation strategies were developed addressing the issues the community raised.

The transportation strategy developed for eastern Davie County responds to existing and projected traffic while respecting the integrity of existing places. The strategy builds on a foundation of community mobility through the addition of roadway capacity along major corridors while enhancing connectivity to existing and future development and offers a balanced approach to transportation in response to the community is connects.

The following pages offer an overview of the alternatives developed.

NC 801 and US 158

Key Issues

In coordination with staff and the community, the following key issues were identified:

- Need for improved mobility, lane utilization queuing, and reduced congestion during the peak hour

Description:

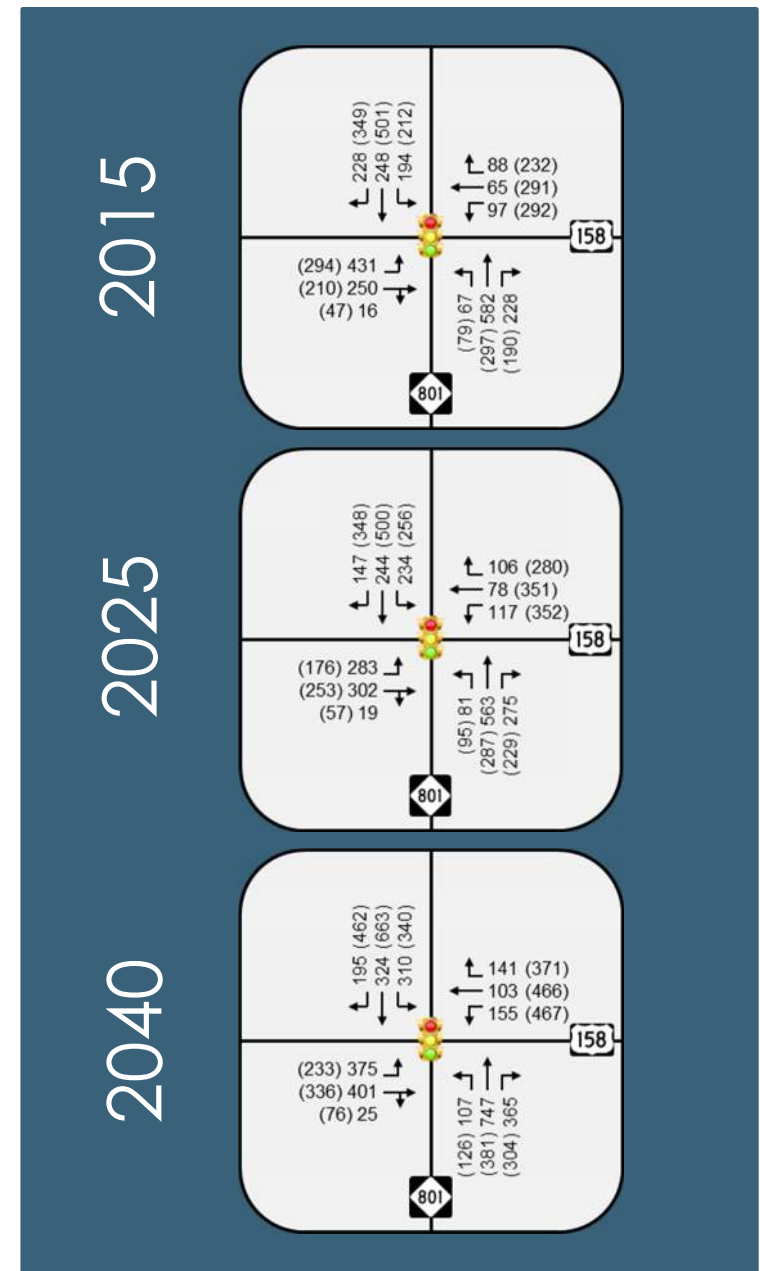
NC 801 serves as the primary access point from I-40 to Bermuda Run and the local and regional commercial development and medical facilities located around the interchange and along US 158. Both NC 801 and US 158 serve as primary conduits for commuters to and from the Winston-Salem area. Frequent peak hour delay and queuing is common at the intersection. Exacerbating the situation is the close spacing of the intersection to the eastbound I-40 ramp terminal (approx. 700 feet) to the north.

To improve the operations for both corridors and the intersection, two alternatives have been evaluated; an improved signalized intersection and a roundabout. Both alternatives address the concerns of the community; congestion, mobility and queuing. It is important to note that the roundabout does require additional right-of-way to construct. Each of the alternatives are depicted on the following pages.

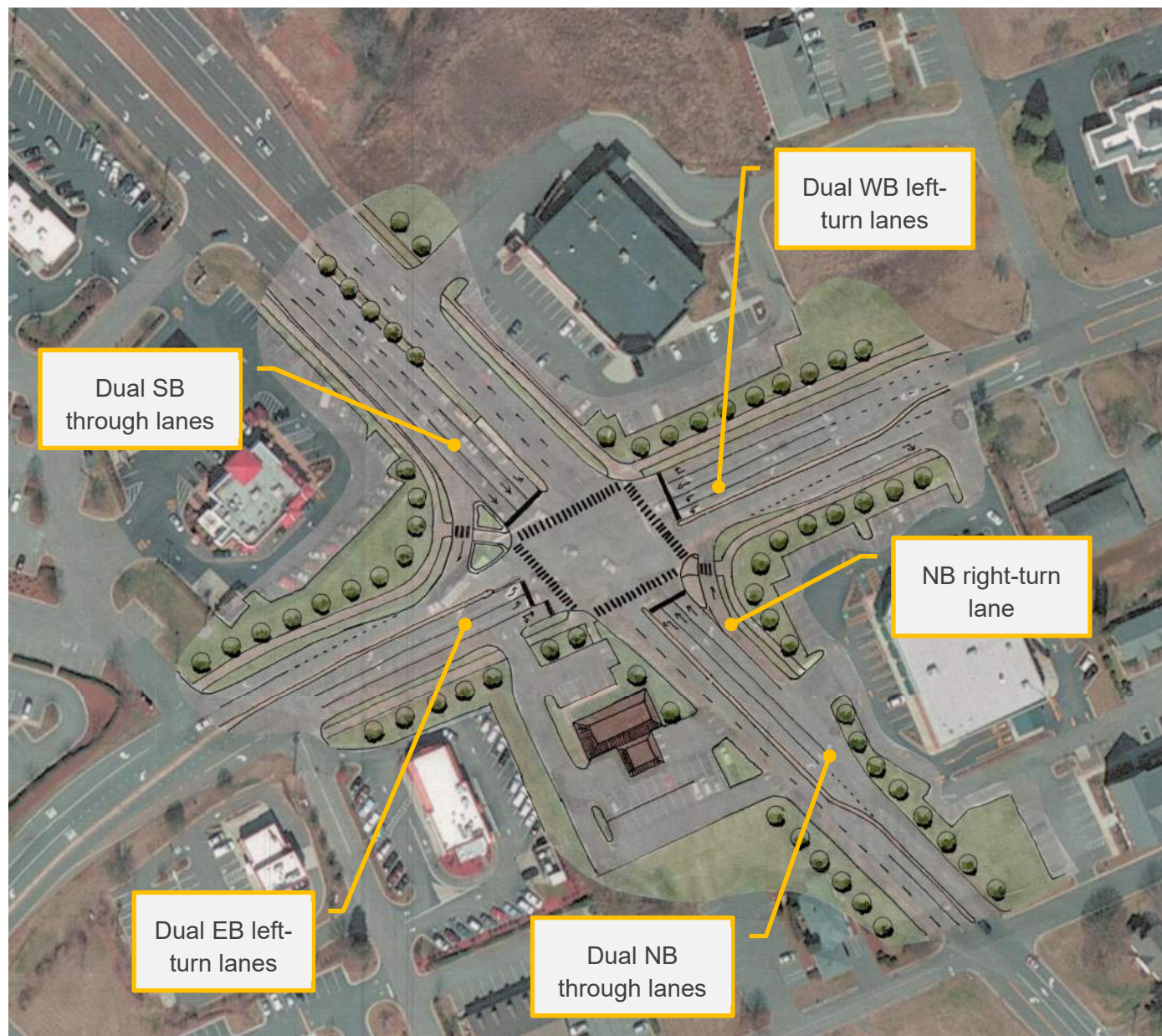
Intersection Overview

The field collected 2015 existing intersection volumes are shown in the graphic to the right. The volumes indicate heavy commuting patterns from west to east in the AM and east to west in the PM peak hours. However, while the typical commuting movements are present, a counter movement, opposite the traditional peak hour movement is also present. For example, in the AM peak hour there is a heavy eastbound left-turn (431 vehicles) from US 158 onto NC 801 and the equivalent returning movement southbound NC 801 onto westbound US 158 in the PM peak hour (349). However, in the PM peak hour for the eastbound to northbound movement from NC 801, there are 294 vehicles turning left. This condition is also present for the eastbound, northbound, and southbound through movements and northbound right turn onto US 158 (PM).

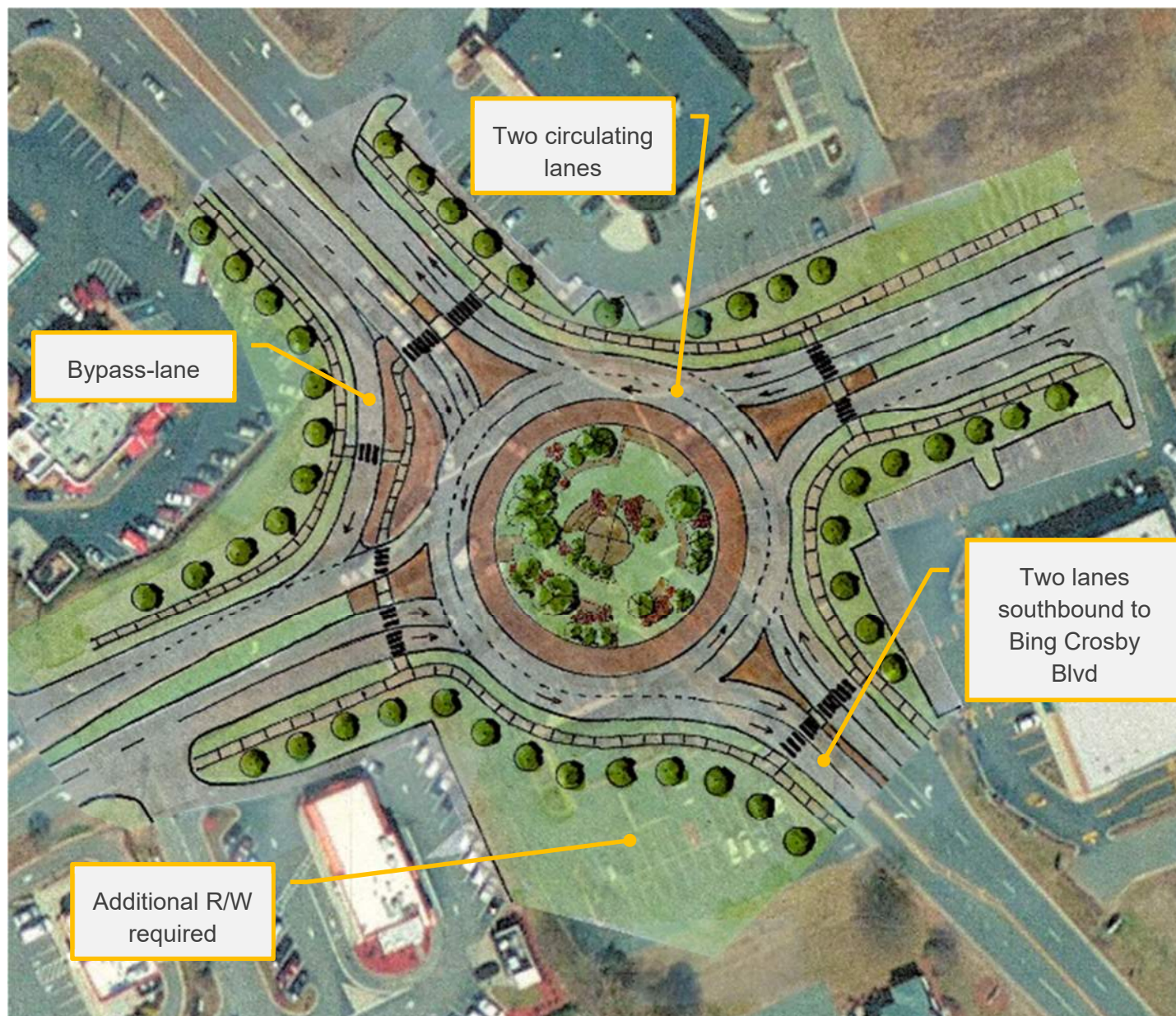
A 1.9% growth rate was used to create the 2025 and 2040 horizon year volumes for the study area. This growth rate was determined based on coordination with stakeholders, the regional travel demand model, and historical count data. The 2025 and 2040 horizon year volumes are shown in the graphic to the right.



Signalized Intersection Concept



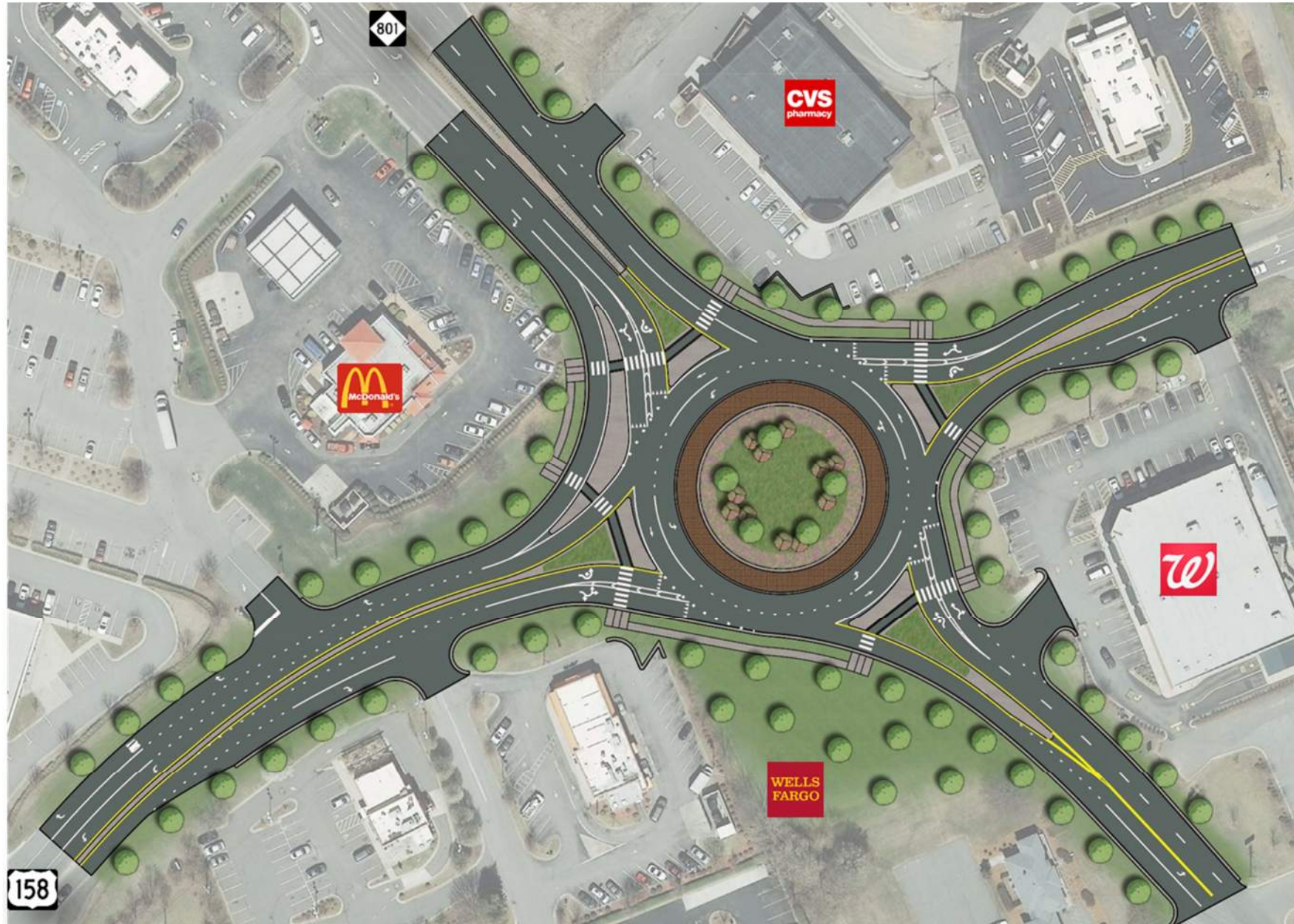
Roundabout Intersection Concept

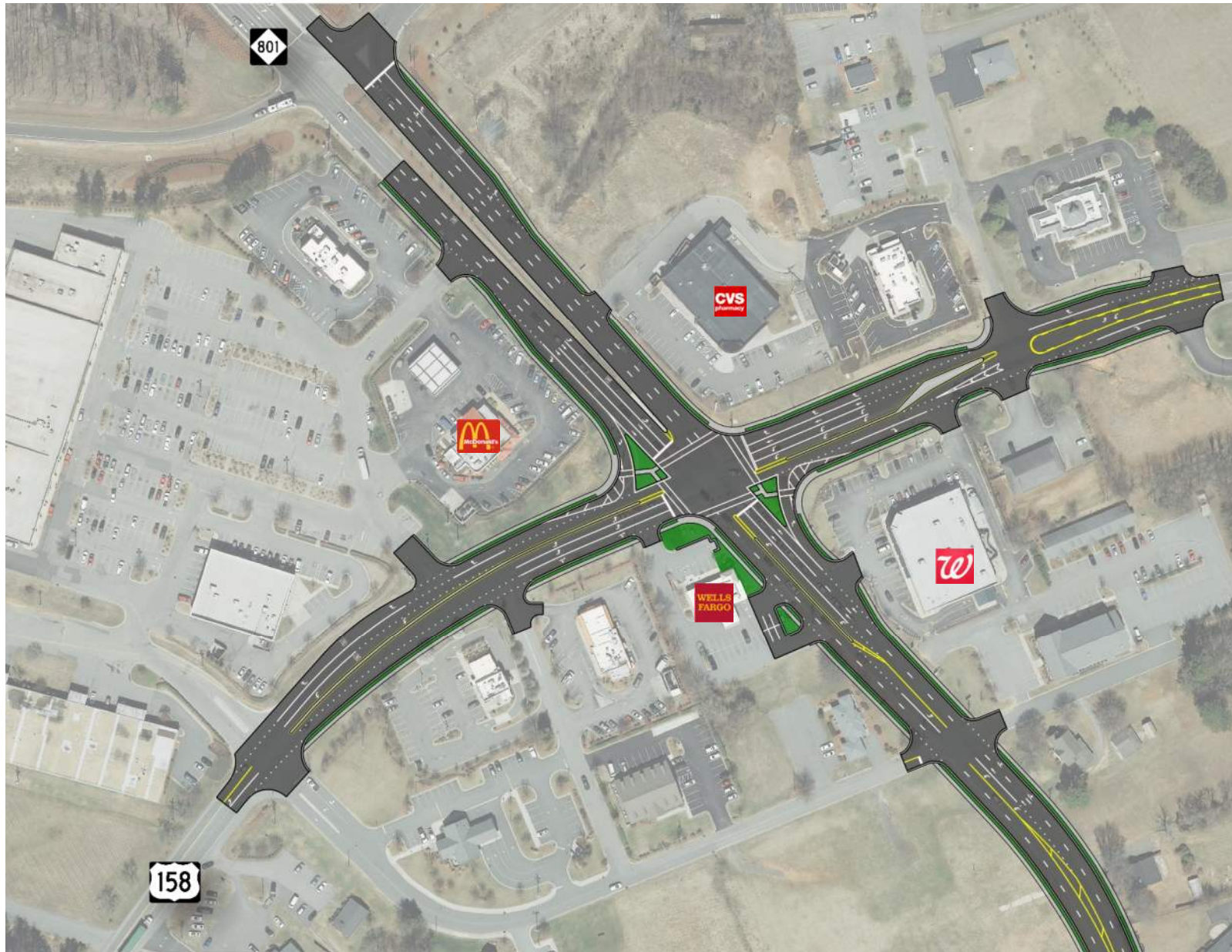


The table shown below provides a comparison of the operations for both alternatives evaluated for the intersection of NC 801 and US 158. The analysis indicates that for the 2025 horizon year, the roundabout is projected to operate at a better overall and approach level of service than the signalized intersection option. Intersection approach queuing is projected to be better under the roundabout alternative as well. It is important to note that under the roundabout scenario, the PM WB approach is projected to be above NCDOT preferred acceptable volume to capacity (v/c) ratio of 0.85. However, due to the projected increased volume during the 2040 horizon year, the signalized intersection option is projected to operate at a better overall level of service than the roundabout option. The approach level of service for the roundabout is projected to operate better than the signalized intersection option for all approaches but the AM NB and PM WB approaches.

The graphics on the following pages provides a design concept for both alternatives.

Condition	Measure	EB			WB			NB			SB			Intersection
		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
AM Peak Hour														
2015 Existing	LOS (Delay)	E (73.8)			C (29.5)			D (39.9)			B (16.4)			D (43.1)
	Synchro 95th Q	#584'	297'	0'	98'	97'	0'	51'	#689'	82'	#203'	210'	48'	
2025 No Build	LOS (Delay)	F (109.7)			C (31.4)			E (75.1)			C (26.7)			E (68.7)
	Synchro 95th Q	#736'	353'	0'	111'	111'	7'	63'	#912'	126'	#345'	246'	60'	
2025 Build Signal	LOS (Delay)	D (46.2)			C (21.1)			C (24.7)			B (11.1)			C (26.1)
	Synchro 95th Q	113'	343'	0'	52'	92'	1'	66'	290'	72'	131'	100'	50'	
2025 Roundabout	LOS (Delay)	A (7.7)			A (9.1)			B (12.0)			A (4.8)			A (8.7)
	Sidra 95th Q	52'	59'	59'	33'	48'	48'	164'	167'	167'	27'	27'	15'	
2040 No Build	LOS (Delay)	F (196.9)			E (56.8)			F (173.8)			F (80.4)			F (145.3)
	Synchro 95th Q	#1061'	#553'	0'	#220'	139'	41'	80'	#1321'	221'	#502'	321'	44'	
2040 Build Signal	LOS (Delay)	D (48.3)			C (22.2)			D (38.0)			C (28.9)			D (36.3)
	Synchro 95th Q	150'	#526'	0'	65'	119'	30'	83'	#424'	210'	#360'	151'	71'	
2040 Roundabout	LOS (Delay)	B (11.0)			B (12.0)			F (148.6)			A (5.0)			E (60.6)
	Sidra 95th Q	106'	122'	122'	56'	87'	87'	1405'	1551'	1551'	43'	41'	22'	
PM Peak Hour														
2015 Existing	LOS (Delay)	D (54.4)			D (42.7)			C (25)			C (22.5)			D (35.1)
	Synchro 95th Q	#328'	280'	0'	#263'	#364'	103'	69'	306'	57'	157'	#590'	164'	
2025 No Build	LOS (Delay)	F (92.5)			E (62.1)			C (31.1)			D (41.1)			D (54.4)
	Synchro 95th Q	#501'	#361'	0'	#418'	#483'	157'	#107'	378'	62'	204'	#801'	216'	
2025 Build Signal	LOS (Delay)	D (47.3)			D (35.4)			C (21.6)			B (13.2)			C (26.8)
	Synchro 95th Q	69'	314'	0'	130'	364'	98'	81'	155'	72'	186'	210'	110'	
2025 Roundabout	LOS (Delay)	B (11.8)			B (14.4)			A (7.0)			A (6.6)			A (9.9)
	Sidra 95th Q	59'	100'	100'	107'	322'	322'	68'	68'	68'	85'	91'	67'	
2040 No Build	LOS (Delay)	F (189.6)			F (173.4)			D (48.6)			F (130.6)			F (137.9)
	Synchro 95th Q	#733'	#560'	0'	#739'	#709'	#301'	#174'	#595'	93'	#502'	#1169'	421'	
2040 Build Signal	LOS (Delay)	D (49.9)			D (41.1)			C (29.6)			C (22.5)			C (33.8)
	Synchro 95th Q	80'	422'	0'	#222'	475'	175'	113'	#218'	89'	310'	303'	254'	
2040 Roundabout	LOS (Delay)	E (59.1)			F (129.7)			B (12.8)			A (10.0)			E (55.3)
	Sidra 95th Q	163'	588'	588'	372'	2393'	2393'	155'	159'	159'	176'	193'	107'	





Currently, mobility is constricted due to the limitations of lane continuity approaching and through the intersection of US 158 and NC 801 and onto I-40. It is not uncommon for vehicles traveling along the NC 801 or US 158 corridors to experience long delays and queuing. The NC 801 northbound queueing and congestion is associated with the existing geometrics and configuration at both the NC 801 and US 158 intersection and the I-40 EB ramp. Currently there is only one through lane on NC 801 northbound while there is two through lanes receiving the traffic. A dedicated right turn lane is adjacent to the through lane that potentially could reduce the NB AM and PM peak hour queue. To better accommodate the two through lanes NB, the lane configuration at the intersection of NC 801 and the I-40 EB ramp needs to be modified to better achieve a more uniform lane utilization. By removing the outside right-turn lane and allowing right-turns from the outside through lane a more uniform lane utilization can be achieved produce a more laminar traffic flow. In addition, the I-40 EB ramp needs to be widened to two lanes merging onto I-40. These improvements should be incorporated into NCDOT's active TIP project I-5794. The graphic to the right depicts the recommended changes.



I-40 at Farmington Road

Key Issues

In coordination with staff and the community, the following key issues were identified:

- Peak hour congestion
- Geometric design deficiencies (no turn-lanes)

Description:

The Farmington Road interchange serves as a local connection to I-40 providing connectivity to the Town of Farmington to the north and US 158 to the south. The interchange also serves as an access point for trucks accessing Ashley Furniture coming from the west. Since its original construction, the interchange and supporting bridge structure have not been modified other than for routine maintenance. At the interchange ramp terminals, turn lanes are only provided on the ramps and not on Farmington Road.

Based on conversations with division staff, the existing bridge structure is in good condition and is not scheduled for replacement in-the-near-future. To accommodate continued growth along Farmington Road, support the existing uses (Vulcan quarry, Davie County Middle school), while maintaining a level of affordability and constructability. The preferred alternative for this interchange is to construct roundabouts at each of the ramp terminals. This will address the need for future widening by eliminating the need for left-turn lanes.





The results of the analysis indicate that the ramp terminals are projected to experience peak hour congestion in the 2025 and 2040 horizon years. With the introduction of a roundabout at the ramp terminals, the intersections are projected to operate at a level of service, for the side street, better than 2015 conditions. The intersections are projected to have additional capacity above the needs associated with the high school. Volumes at the ramp terminals and the appropriate level of service and queuing information are found on the next page and to the right, respectively.

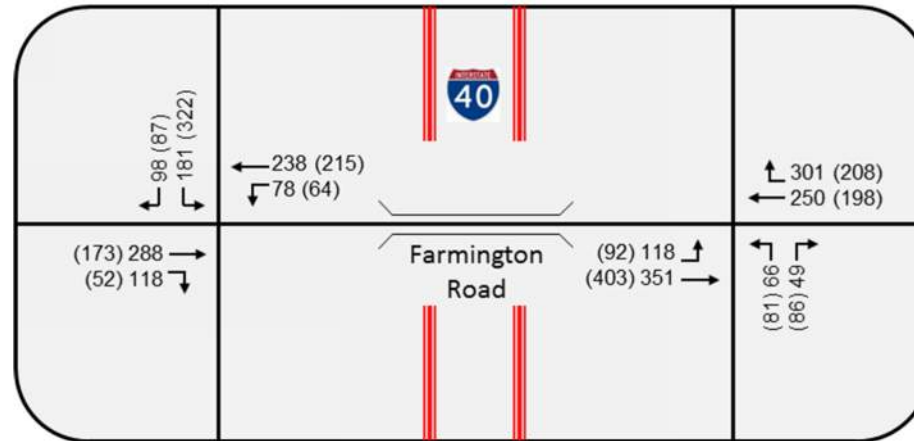
Westbound Ramps

Condition	Measure	WB	NB	SB	Intersection
AM Peak Hour					
2015 Existing	LOS (Delay)	C (19.6)	A (2.5)	A (0.0)	-
	Synchro 95th Q	63'	5'	0'	
2025 No Build	LOS (Delay)	D (34.3)	A (2.8)	A (0.0)	-
	Synchro 95th Q	131'	7'	0'	
2025 Build Roundabout	LOS (Delay)	A (8.3)	A (3.0)	A (4.6)	A (5.1)
	Sidra 95th Q	54'	0'	95'	
2040 No Build	LOS (Delay)	F (206.3)	A (3.3)	A (0.0)	-
	Synchro 95th Q	432'	10'	0'	
2040 Build Roundabout	LOS (Delay)	B (12.1)	A (3.5)	B (13.3)	A (9.8)
	Sidra 95th Q	114'	0'	281'	
PM Peak Hour					
2015 Existing	LOS (Delay)	C (21.8)	A (2.1)	A (0.0)	-
	Synchro 95th Q	108'	4'	0'	
2025 No Build	LOS (Delay)	E (47.5)	A (2.2)	A (0.0)	-
	Synchro 95th Q	239'	4'	0'	
2025 Build Roundabout	LOS (Delay)	A (9.1)	A (2.9)	A (5.1)	A (6.2)
	Sidra 95th Q	87'	0'	50'	
2040 No Build	LOS (Delay)	F (269.9)	A (2.5)	A (0.0)	-
	Sidra 95th Q	739'	6'	0'	
2040 Build Roundabout	LOS (Delay)	B (14.8)	A (2.9)	A (8.3)	A (9.6)
	Sidra 95th Q	219'	0'	102'	

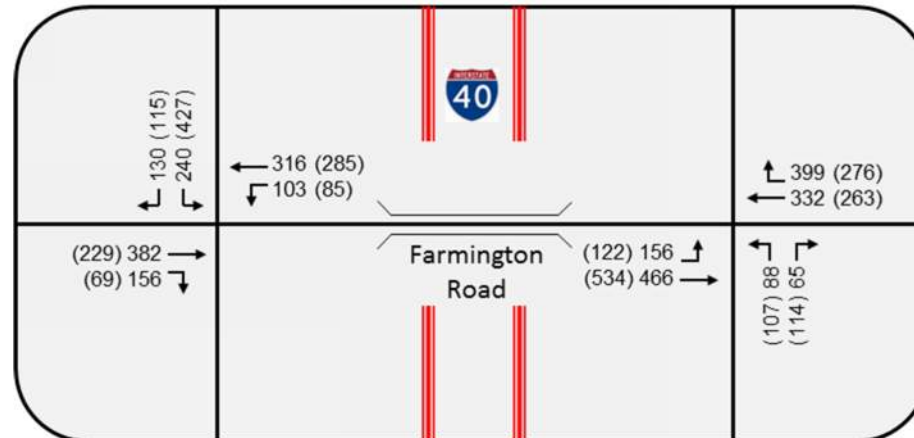
Eastbound Ramps

Condition	Measure	EB	NB	SB	Intersection
AM Peak Hour					
2015 Existing	LOS (Delay)	C (19.4)	A (0.0)	A (3.1)	-
	Synchro 95th Q	25'	0'	9'	
2025 No Build	LOS (Delay)	D (29.5)	A (0.0)	A (3.6)	-
	Synchro 95th Q	51'	0'	12'	
2025 Build Roundabout	LOS (Delay)	B (11.5)	A (5.8)	A (3.7)	A (5.5)
	Sidra 95th Q	25'	143'	0'	
2040 No Build	LOS (Delay)	F (137.1)	A (0.0)	A (5.1)	-
	Synchro 95th Q	175'	0'	20'	
2040 Build Roundabout	LOS (Delay)	B (13.7)	B (15.7)	A (3.7)	B (10.5)
	Sidra 95th Q	42'	466'	0'	
PM Peak Hour					
2015 Existing	LOS (Delay)	C (16.8)	A (0.0)	A (2.2)	-
	Synchro 95th Q	26'	0'	6'	
2025 No Build	LOS (Delay)	C (24.0)	A (0.0)	A (2.5)	-
	Synchro 95th Q	59'	0'	8'	
2025 Build Roundabout	LOS (Delay)	B (11.1)	A (4.9)	A (3.1)	A (5.1)
	Sidra 95th Q	36'	84'	0'	
2040 No Build	LOS (Delay)	F (182.1)	A (0.0)	A (3.4)	-
	Synchro 95th Q	327'	0'	12'	
2040 Build Roundabout	LOS (Delay)	B (14.2)	A (7.3)	A (3.1)	A (6.5)
	Sidra 95th Q	65'	171'	0'	

2025 Horizon Year Volumes



2040 Horizon Year Volumes



US 158 at Farmington Road

Key Issues

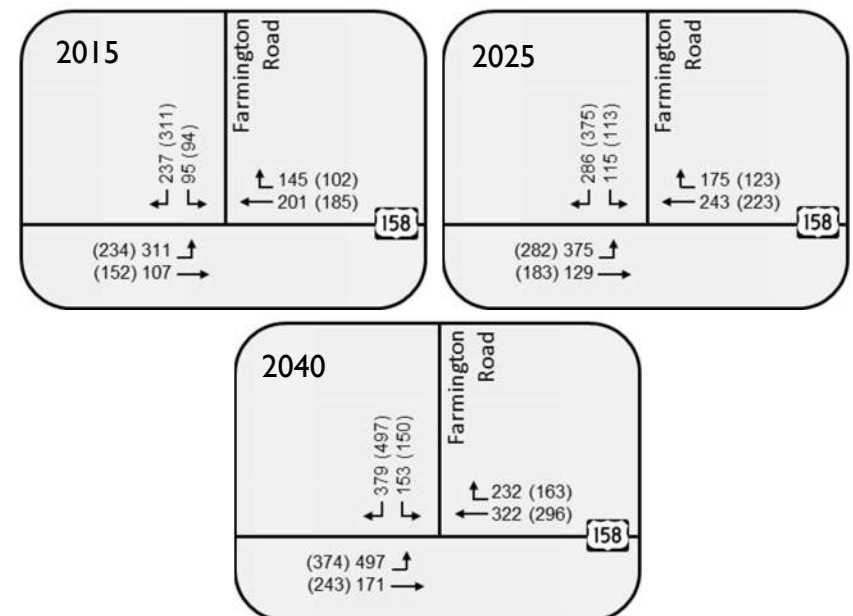
In coordination with staff and the community, the following key issues were identified:

- Peak hour congestion
- Available sight distance
- High speeds

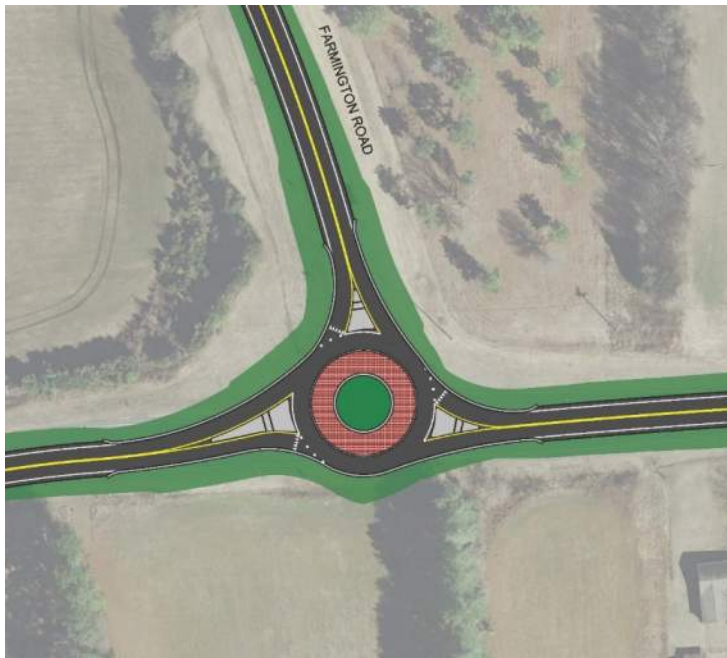
Description:

The intersection of US 158 and Farmington Road serves as the interface between US 158 and Farmington Road and ultimately I-40 for residents in Mocksville and eastern Davie County. The intersection is currently under stop control and both right and left-turn lanes on all approaches. The intersection is located within a 45-mph speed zone, but observes speeds indicate vehicles travel above the posted speed limit. The intersection lies just east of a horizontal curve, that combined with vehicles traveling above the speed limit can reduce the available time to turn left from Farmington Road onto US 158.

To address the key issues listed above a roundabout is recommended as a mitigation strategy for this intersection.



The proposed roundabout at the intersection of US 158 and Farmington Road is projected to operate at an acceptable level of service in 2025 and is projected to have sufficient capacity to accommodate additional growth on US 158 and Farmington Road. As shown in the table below, the roundabout is projected to reduce the AM SB queue from 497 ft. to 102 ft. Similarly, in 2040, the roundabout is projected to reduce the PM SB queue from 1412 ft. to 403 ft. However, in 2040, the AM WB approach is projected to exceed NCDOT preferred acceptable volume to capacity (v/c) ratio or 0.85.



Furthermore, the SB approach LOS during the 2025 horizon year goes from LOS F to LOS A in the AM peak hour and from LOS D to Drivers on the EB and WB approaches, which currently do not stop or yield to on-coming traffic, will experience a slight increase in delay as they are now forced to yield the right-of-way to all approaches. During the 2040 horizon year, the SB approach goes from LOS F to LOS B in the PM peak hour. The graphic below depicts the layout of the roundabout. The green area adjacent to the roadway depicts the construction limits.

Condition	Measure	EB	WB	SB	Intersection
AM Peak Hour					
2015 Existing	LOS (Delay)	A (6.4)	A (0.0)	C (22.0)	-
	Synchro 95th Q	26'	0'	91'	
2025 No Build	LOS (Delay)	A (6.8)	A (0.0)	F (171.9)	-
	Synchro 95th Q	35'	0'	497'	
2025 Build Roundabout	LOS (Delay)	A (7.2)	A (7.6)	A (6.2)	A (7.1)
	Sidra 95th Q	123'	140'	102'	
2040 No Build	LOS (Delay)	A (7.8)	A (0.0)	F (Err)	-
	Synchro 95th Q	62'	0'	Err	
2040 Build Roundabout	LOS (Delay)	B (10.3)	C (34.1)	B (12.1)	B (18.4)
	Sidra 95th Q	288'	570'	259'	
2015 Existing	LOS (Delay)	A (5.1)	A (0.0)	C (16.1)	-
	Synchro 95th Q	18'	0'	52'	
2025 No Build	LOS (Delay)	A (5.3)	A (0.0)	D (27.2)	-
	Synchro 95th Q	23'	0'	198'	
2025 Build Roundabout	LOS (Delay)	A (6.3)	A (4.6)	A (6.2)	A (5.8)
	Sidra 95th Q	103'	79'	132'	
2040 No Build	LOS (Delay)	A (5.8)	A (0.0)	F (645.8)	-
	Synchro 95th Q	38'	0'	1412'	
2040 Build Roundabout	LOS (Delay)	A (7.4)	A (9.2)	B (15.5)	B (10.9)
	Sidra 95th Q	196'	188'	403'	

US 158 at Baltimore Road

Key Issues

In coordination with staff and the community, the following key issues were identified:

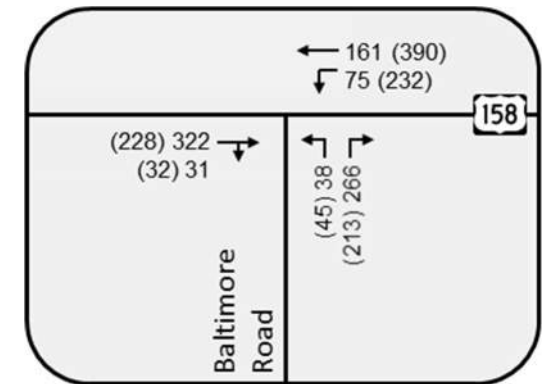
- Heavy vehicle turning movements
- Peak hour congestion & delay



Description:

With or without a potential connection of Baltimore Road to a new interchange with I-40, the intersection of Baltimore Road and US 158 will continue to process heavy vehicles in addition to the motor vehicles using this intersection. The current unsignalized intersection serves as the point for which vehicles determine an easterly or westerly travel path. The intersection has been configured to handle heavy vehicles, from its wide corner radii, to a 500-ft. left-turn lane on US 158; the intersection is designed to accommodate heavy vehicles. Given the frequency for which heavy vehicles use this intersection, on and off-peak hour congestion is present. While the posted speed on US 158 is 45 mph, vehicles often travel above the posted speed limit. The combination of higher speeds, slow startup times for heavy vehicles, and high peak hour volumes, peak hour congestion is concerning for residents and business owners in the study area. 2015 existing traffic volumes are shown to the right.

The traffic volumes show that the predominate movements at the intersection are from NB to EB in the AM and the reverse in the PM, which shows drivers are favoring the NC 801 interchange to the Farmington Road interchange, if their destination is I-40. This most likely is based on distance to travel (3 miles vs. 4.5 miles), but could also include the presence of traffic signals, turn lanes, and wider lanes. Traffic congestion does not appear to be a determining factor.



Two options were considered for this intersection with the extension of Baltimore Road to I-40, but are feasible for implementation without a new interchange. Alternative 1 builds on the existing infrastructure present at the intersection, but adds a traffic signal for traffic control. Alternative 2 converts the existing intersection to a roundabout.

Both options will accommodate existing and future truck and motor vehicle traffic adequately. However, there are others factors, beyond just operations, that should be considered and evaluated further prior to implementation of either alternative.

Signal

- Operational control during power outages
- Crash types & potential frequency
- Higher speed differential
- Vehicle start up time
- Lower potential cost
- Maintenance

Roundabout

- Control during power outages
- Crash types & potential frequency reduction
- Lower speed differential
- Vehicle start up time
- Higher initial cost
- Impacts to adjacent properties
- Needs additional R/W





5

NEXT
STEPS

Davie County *Transportation
Alternatives Feasibility Study*

Next Steps

The Davie County Transportation Alternatives Feasibility Study began with the intent to collect, refine and communicate a mobility strategy for the study area. This plan represents the contribution of the communities of Davie County and Bermuda Run, technical staffs at WSMPO and NCDOT, and local staffs in these communities. For successful implementation, it will require partnerships among government entities, stakeholders, private developers and the people that live and work within the communities that makeup the study area.

Given the critical role the study area streets play in the overall transportation network supporting these communities and industries, there is a sense of urgency to expedite implementation of this study. This project complements the overall development strategies set forth by the community and represents an investment in this corridor that will help promote economic vitality of the region.

Identifying the most appropriate outcome represents a major milestone in the process; however, several work tasks remain. To realize the vision established during this planning

process the following tasks will require follow-through by the communities:

- **Study Endorsement:** The results of the Davie County Transportation Alternatives Feasibility Study should be carefully considered and endorsed by Davie County, Town of Bermuda Run, WSMPO, and NCDOT. This endorsement will memorialize the agreements established during the planning process and reduce the risk of having to revisit some of the issues contemplated during the study. Endorsement should happen both as individual entities as well as collectively. A Memorandum of Understanding that is endorsed by these collective parties will guarantee a consistent partnership remains in place until implementation is complete.
- **Plan Concurrence:** Local and regional plans should be amended to include the interchange to memorialize the agreed upon strategy as well as serve as a mechanism to protect and promote the implementation of the interchange as development occurs.

- **Concepts:** Endorsement of the preferred intersection configurations contained herein by the Davie County, Town of Bermuda Run, WSMPO, and NCDOT will ensure a consistent implementation of the plan. It will likewise allow these communities to continue with some certainty that future planning efforts will consider the work contained herein.
- **Interchange Justification Report:** It is recommended that Davie County begin the development of the IJR and environmental documentation process to formally begin the process of getting a new interchange on I-40. This process will involve FHWA, NCDOT Division 9, and NCDOT staff in Raleigh.
- **Financing Partnership:** The expense associated with implementation suggests that an exclusive local funding source is not likely. In addition, the traditional process for funding via the NCDOT Strategic Transportation Investments (STI) program may not yield a desired project schedule. If the parties involved are interested in improving their chance of reduced implementation duration creativity, initiative, and partnerships may prove beneficial. Considerations that may increase the likelihood of funding include: adoption of the Memorandum of Understanding, dedication of right-of-way by affected property owners (rather than NCDOT right-of-way acquisition), and the use of local dollars supplemented with funds from grants and programs external to existing NCDOT funding. These should help elevate the exposure of the project and increase the likelihood of securing full funding and implementation in a timely manner.
- **FHWA Fastlane Grant:** The Federal Highway Administration has developed the FASTLANE Grant Program to provide funding for projects that address critical freight issues for our nation's infrastructure system. With the project falling within the urbanized boundary of the Winston-Salem MPO, impacting a facility on the National Highway System (NHS), and with a primary purpose of improving freight mobility, this project meets the eligibility requirements.

Local partnerships can take many forms, but in this case, it represents an opportunity to leverage that fact that the projects discussed in this study are in an area of change and growth. The communities of Davie County and Bermuda Run should continue to foster their relationships with the WSMPO, NCDOT, and FHWA as they work towards implementation of the recommendations contained within this study.